CONSEIL PERMANENT INTERNATIONAL POUR
L'EXPLORATION DE LA MER
CHARLOTTENLUND SLOT. — DANEMARK

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ET
PROCÈS-VERBAUX DES RÉUNIONS

VOLUME CIX

2ÈME PARTIE
RAPPORT ADMINISTRATIF

(1938—1939)

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REPORT

of

ADMINISTRATION 1938—1939.

(April 18th, 1939).

I. General.

Composition of the International Council for the Exploration of the Sea.

During 1938—39 the Icelandic Government joined the Council and thus increased the number of Adhering Countries from fourteen to fifteen. No Government has retired but the connexion with Spain has been disturbed by the difficult period through which this country has passed; the recent change of Government in Spain has not left time to get into contact with the new Government to confirm the continued adhesion and no list of Delegates and Experts is expected to reach the Bureau before the coming Council Meeting.

The Council has suffered the loss of one of its outstanding experts: Mr. J. O. Borley, who had been connected with the work since 1903.

On July 1st 1938, the English Delegate, Mr. Henry G. Maurice, retired from the post of Fisheries Secretary to the Ministry of Agriculture and Fisheries and has ceased to be Delegate to the Council; he was succeeded in both capacities by Mr. A. T. A. Dobson, Mr. Maurice's successor as Fisheries Secretary. The only other change of Delegates announced at the date of going to press, is the appointment of Prof. Hans Pettersson *in lieu* of Prof. Zeilon, Sweden.

Composition of the Bureau.

At the Council Meeting in May, 1938, the President, Mr. Henry G. Maurice, announced his retirement by July 1st, from which date Professor Johan Hjort took over the duties of the presidentship. The vice-presidentship thus rendered vacant was filled by the election of the new English Delegate, Mr. A. T. A. Dobson and the present Bureau thus consists of:— Professor Johan Hjort, Norway, President; M. Théodore Tissier, France, Dr. C. Heinrici, Germany, Professor Martin Knudsen, Denmark, and Mr. A. T. A. Dobson, England, Vice-Presidents;—Mr. Henry G. Maurice was elected Président d'Honneur from the date of his retirement and with Professor Otto Pettersson, Président d'Honneur since 1932, he enjoys the right of attending all meetings of the Council as well as of the Bureau.

Committees.

At the Council Meeting in May, 1938, Dr. E. S. Russell was elected Chairman of the Consultative Committee *in lieu* of Professor Johan Hjort; the new Chairman asked to have the support of Dr. Ed. le Danois and Professor A. Hagmeier as Vice-Chairmen.

The chairmanship of the North-Eastern Area Committee was taken over by Mr. Oscar Sund, who asked for the support of Professor A. Hagmeier as Vice-Chairman, and Dr. J. J. Tesch was appointed Vice-Chairman of the Combined North Sea and Eastern Channel Committee. —Professor Rafael de Buen replaced Dr. A. Ramalho as Vice-Chairman of the Atlantic Slope Committee. The chairmanship of the Whaling Committee was taken over by Dr. N. A. Mackintosh.

A list of Committees will be found in the Procès-Verbaux of the last Council Meeting; apart from the loss of Mr. J. O. Borley as a member of the Whaling Committee no change has been announced; possible changes will be recorded in the Procès-Verbaux of this year's meeting.

Income and Expenditure Account for the year ending March 31st 1939

EXPENDITURE

		Estimates	Expenditure	
	I. Incidentals			
1	President	*14,500.00*	6,000.00	
2	Hydrogr. Consultant		3,000.00	
3	Editor of Statistics		2,000.00	
4	Editors of Journal		3,500.00	
				14,500.00
	II. Headquarter Staff			
5	Adm. Secretary	*12,000.00*	12,000.00	
6	Hydrographer	*3,000.00*	3,000.00	
				15,000.00
	Clerical Staff			
7	1st Asst. Secretary	*27,500.00*	6,000.00	
8	2nd — —		5,000.00	
9	Statistical —		4,800.00	
10	Secretarial Assistant		2,700.00	
11	Hydrograph. Secretary		3,000.00	
12	Clerical Assistance		6,000.00	
				27,500.00
	III. Office Expenses			
13a	Rent	*15,000.00*	5,580.00	
b	Heating		1,000.00	
c	Stationery, Books, etc.		2,994.58	
d	Teleph., Telegr., Postage		1,616.54	
e	Furniture and Fittings		20.20	
f	Insurance		494.11	
g	Upkeep, Cleaning, Rep.		1,915.17	
h	Miscellaneous		2,514.36	
i	Council Meeting Exp.		899.90	
				17,034.86
14	**IV. Travelling Expenses**	*16,000.00*		17,231.86
15	**V. Chairmen of Committees**	*31,000.00*		30,260.98
16	**VI. Printing and Distribution**	*42,000.00*		39,709.51
	Ordinary Expenditure	*161,000.00*		161,237.21
	VII. Extraordinary Expenditure			
17	Mr. SANDSTRÖM's work: Granted by the Council, 1936. 5,750.00 Contrib. from the Assoc. Int. d'Océanogr. Physique £ 250 5,593.75 = 11,343.75 Spent 1936-38 4,626.02	*6,717,73*	4,293.85	
18	Material for Standardisation of Photocells etc.	*1,716.50*	1,497.67	
19	Fittings	*3,500.00*	3,472.64	
20	Office Expenses for Hydrographical-Biological Committee	*1,000.00*	481.80	
				9,745.96
	VIII. Pension Fund			
21	Transferred according to Standing Resolution	*3,500.00*	3,500.00	
22	Refund of Pension	*6,500.00*	6,500.00	
				10,000.00
	Total Expenditure	*183,934.23*		**Kr.** 180,983.17

INCOME

		Estimates	Income	
	I. Annual Contributions.			
	Germany $^{18}/_{8}$ 38 1938—39	*20,000.00*	20,000.00	
	Sweden $^{11}/_{8}$ 38 —	*10,000.00*	10,000.00	
	Poland $^{26}/_{10}$ 38 —	*10,000.00*	10,000.00	
	Denmark $^{8}/_{11}$ 38 —	*10,000.00*	10,000.00	
	Norway $^{16}/_{2}$ 39 —	*10,000.00*	10,000.00	
	Iceland $^{23}/_{2}$ 39 —	*10,000.00*	10,000.00	
	Latvia $^{31}/_{1}$ 39 —	*5,000.00*	5,000.00	
	Portugal $^{18}/_{3}$ 39 —	*5,000.00*	5,000.00	
	Receipts as per 31st of March 1939 (Outstanding as per 31st of March 1939 Kr. 70,000.00)			80,000.00
	France $^{15}/_{4}$ 39 —	*20,000.00*	20,000.00	
	Great Britain —	*20,000.00*		
	Spain —	*20,000.00*[1])		
	Belgium $^{17}/_{4}$ 39 —	*10,000.00*	10,000.00	
	Holland —	*10,000.00*		
	Éire —	*5,000.00*		
	Finland —	*5,000.00*		
		170,000.00		
	Receipts after April 1st			30,000.00
	Outstanding as per 18th of April.			40,000.00
	II. Interest on Bank Deposits	*1,000.00*	1,137.56	
	Interest on Investments	*6,000.00*	6,000.00	
		7,000.00		7,137.56
	III. Sale of Publications	*2,500.00*		2,278.33
	Total Receipts	179,500.00		159,415.89
	Excess of Ordinary Expenditure over Income			1,821.33
				161,237.22
	Extraordinary Expenditure			19,745.96
				Kr. 180,983.17

[1]) Not included in Outstanding Contributions pending future decision.

Statement of Pension Fund Accounts 1938—1939.

EXPENDITURE		INCOME	
rs. Drechsel's pension	6,500.00	Balance as per April 1st, 1938	56,233.18
lance as per March 31st, 1939	62,545.60	Transferred from revenue	3,500.00
		Refund of pension paid	6,500.00
		Interests	2,822.42
Kr.	69,045.60	Kr.	69,045.60

Balance Sheet, 31st March, 1939.

LIABILITIES			ASSETS		
pital Reserve:			Cash at Handelsbanken	12,669.54	
Balance per April 1st, 1938	250,811.27		— - Ordrup-Charlottenlund Bank	7,001.87	
less Excess of ordinary Income over ordinary Expenditure	1,821.32		— in hand	979.15	
	Kr. 248,989.95			Kr.	20,650.56
less Extraordinary Expenditure chargeable to Capital Reserve	19,745.96		Danish Treasury Bonds (nom. value Kr. 120,000; Market value on March, 31st, 1939 Kr. 120,300) at cost		118,543.43
	Kr. 229,243.99				
less Spain's contribution for 1937/38 written off	20,000.00		Pension Fund:		
		209,243.99	Cash at bankers	169.70	
Pension Fund		62,545.60	Danish Treasury Bonds (nom. value 63,000; Market value on March 31st, 1939, Kr. 62,470) at cost	62,375.90	
					62,545.60
Total Funds		271,789.59			
Sundry Creditors as per March 31st, 1939		7.30	Sundry Debtors as per March 31st, 1939		70,057.30
		Kr. 271,796.89			Kr. 271,796.89

Audit of Accounts.

The accounts for the year 1937—38, published in e Administrative Report of last year (Vol. No. 107, p. 5), have been audited by qualified accountants d inspected by the Finance Committee and they l be submitted to the Council for final approvement. A preliminary statement of accounts for the year 38—39 is given overleaf and it is expected that they y pass audit before the Council Meeting this year. The statement gives rise to the following remarks:— m III: Office Expenses, has been overdrawn by 2,034.86 mainly due to heavy demands for tionery, new compulsary staff-insurances and dry expenses.—Item IV: Travelling Expenses, has been overdrawn by Kr. 1,231.86 due to the essity of having an extra sitting of the Sub-Committee on Combined Hydrographical and Biological estigations.

tem V: Chairmen of Committees, is less than imated due to the return by Dr. Ramalho of his quarter's honorarium as he had been unable to ry out any work.—Item VI: Printing and Distribon, records a saving of some Kr. 2,300 only, in e of the fact that two publications have been tponed; the cost of paper and wages has increased cost of publications in general by some 20 %; distribution also has made increased demands, while translations have been kept as low as possible.

Extraordinary Expenditure have kept within the estimates and do not give rise to any remarks.

As to Income, Contributions show a total of Kr. 20,000 less than estimated, as that of Spain, according to the auditor's decision, should not be included until a continued adhesion is confirmed.—By the 31st of March the contributions outstanding amounted to Kr. 70,000 (plus Spain Kr. 20,000) as against Kr. 90,000 last year.

The Balance Sheet prepared opens with Capital at April 1st, 1938, Kr. 250,811.27; not counting the Spanish contribution, the total excess of expenditure over income amounts to Kr. 21,567.28, which reduces the funds to Kr. 229,243.99. By correspondence between the former Spanish Government and the Bureau, the Spanish contribution still outstanding for the previous year, 1937—38, was acquitted, and a further sum of Kr. 20,000 has thus to be deducted from the Balance, leaving a Capital Reserve at March 31st, of Kr. 209,243.99; to this should be added the Pension Funds of Kr. 62,545.60 (as against Kr. 56,223.18 last year) bringing the Funds of the Council up to a total of Kr. 271,789.59 as against Kr. 307,034.45 last year. The reduction of about Kr. 35,000 thus comes about by writing off two years'

contribution from Spain, a loss that may still be reduced by any contribution received from Spain for the period in question.

Meetings.

Meetings of the Bureau took place in May, 1938, and March, 1939, in Copenhagen, all members of the Bureau and the Administrative Secretary being present on both occasions.

In accordance with the decisions of the Council (Rapp. et Proc.-Verb., Vol. No. 107, I, p. 15, 25 (3), 41, 59) a meeting of the Sub-Committee on Combined Hydrographical and Biological Investigations took place in Copenhagen on November 7th and 8th, 1938, and a second sitting of this Committee took place in Paris (granted by the Bureau) on February 20th and 21st, 1939. Both meetings were attended by Professor M. Knudsen (Chairman), Dr. Stanley Kemp, Dr. Ed. le Danois, Professor H. H. Gran, and Professor B. Schulz as well as the President and the Administrative Secretary; the latter meeting was further attended by Dr. E. S. Russell. A report appears on page 65.

The Faxa Bay Committee—Chairman Dr. Å. Vedel Tåning—has been working in accordance with the decision of the Council (Rapp. et Proc.-Verb., Vol. No. 107, I, p. 14, 25 (2), 26, 47 (2)); the Secretary, Mr. A. Fridriksson, worked in Copenhagen during the months of October/November, 1938 and March, 1939, and a meeting took place on March 17th to 20th, 1939, attended by Dr. Tåning, Mr. M. Graham and Mr. Fridriksson and, partly, by Professor Johan Hjort and the Administrative Secretary. A preliminary report appears on page 20.

II. Work in Copenhagen.

This has been re-organised into four separate departments: I, Accounts and correspondence; II, Publications and library; III, Hydrography, and IV, Statistics. The work has been carried out according to ordinary routine and along the customary lines, with the addition this year of a fair number of reports and papers typed and duplicated in connexion with the Faxa Bay Committee, the Faroe Committee, the Sub-Committee on Combined Hydrographical and Biological Investigations, the "Annales Biologiques", and the Scientific Meeting. A list of publications issued is given below and special hydrographical and statistical work will be reported to the relevant Committees.

Mr. A. Lomholt tendered his resignation on December 31st, 1938, on his appointment as full-time Secretary of "Videnskabernes Selskab", and has been temporarily replaced by Miss Inger Knudsen.

The Administrative Secretary went to Berlin in January to prepare for the Council Meeting, and attended also in January the opening of the Oceanographic Institute in Gothenburg.

Report regarding cost of publications issued during the financial year 1938—39.

Series	Volume	Pages	Subject	Estimated	Cost
Rapp. & Procès-Verbaux	CVII	220	Procès-Verbal, Rapport Administratif et Appendices ...	*6,000*	6,675.94
—	CVIII	170	Report on Special Meetings (in 3 parts)	*5,000*	6.070.70
			Rapport Atlantique.....	*2,000*	0
Bulletins		120	Bulletin Hydrographique, 1937.....	*5,000*	5,246.89
			Mr. Lomholt's Report on TS-Diagrams for the North Atlantic	*3,000*	0
—		77	Bulletin Statistique, 1936.....	*2,000*	2,060.27
Journal du Cons.	XIII, 1—3	439	.....	*9,000*	9,334.23
		145	Index-Volume.....	*2,500*	3,682.35
			Miscellaneous.....	*1,500*	928.26
			Total...	*36,000*	33,998.64
			Translations.....	*3,000*	1,319.05
			Distribution.....	*3,000*	4,391.82
			Grand Total...	*42,000*	39.709,51

Reports of Area Committees.

NORTH-EASTERN AREA COMMITTEE

1938.

By

Oscar Sund.

The following authors have contributed to the Administrative Report, 1938: Prof. Dr. Hagmeier, Dr. Lundbeck, Mr. Granqvist, Mr. Davis, Dr. Täning, Mr. Bjerkan, Mr. Rollefsen and Capt. Iversen, and the Chairman's gratitude be hereby recorded. The report has been arranged under the following headings:

Cruises, Oceanography, Plankton, Biology and other Investigations.

CRUISES.

England.

An observer was attached a trawler on its cruise to the neighbourhood of Bear Island to make measurements and investigations into food and maturity of cod, etc. — 521 specimens were marked.

Germany.

In continuation of work commenced in 1937, to investigate fish and fishery on the north-eastern Atlantic shelf the "Deutsche Wissenschaftliche Kommission für Meeresforschung" chartered the fishing vessel "Heinrich Baumgarten", Kapitän Eisenhardt, from the Wesermünde-company Kaempf, and undertook three cruises to the area (see chart, p. 9):

Cruise I: 13th March—5th April 1938: Northern Norwegian coast, Finmark, Skolpenbank, Northern Deep.

Cruise II: 7th April—1st May 1938: Middle and northern Norwegian coast, Bear Island Deep, Bear Island Bank, Tromsö-Ground, Malang Ground.

Cruise III: 28th August—27th September 1938: Norwegian coast. Bear Island Deep, Spitsbergen Bank.

Observations were made by experts from the "Biologische Anstalt", "Arbeitsstelle der DWK auf Helgoland", "Arbeitsstelle für Fischereiforschung in Wesermünde" and "Deutsche Seewarte, Hamburg".

The object of these cruises is: Investigation of the food-fish stocks and their environment, viz., to determine local size- and age-distributions and the dependence of these on depths and hydrographical factors. These repeated cruises and the planned series of cruises by the new research vessel are expected to result in definite knowledge as to seasonal variations in distribution and composition of the stocks (migrations, fluctuations), and from such results to arrive at causes of variations.

During all expeditions, lists of measurements, material for age-determinations and food-observations were collected. The yield-capacity of the commercial fishery was subject to careful observation at each fishing-ground. The usual commercial gears were used, and by means of a make-shift arrangement on the large winch it was possible to collect the hydrographical samples. Notes on catch of other species and samples of surface-plankton complete the list of environmental material obtainable from a fishing vessel.

The nature of the work will appear from the table attached.

Cruises of the "Heinrich Baumgarten" 1938	I	II	III
Hauls with the large trawl for scientific purposes	39	37	39
Total number of fish measured, weighed and partly sex-determined	12,125	13,022	11,316
Age-determinations	4,419	4,267	4,647
Maturity-determinations	3,401	5,840	—
Stomach-contents investigated	80	179	84
Total weight of fish investigated, in kg.	24,000	32,133	19,212
Hauls with small surface-net (Silk 20)	36	49	39
Filtered surface plankton samples	46	—	59
Young-fish-net hauls	—	—	8
Hydr. observations, mostly in series	47	46	44

A detailed report on the 1937-cruises of fishing-vessels is in press, and a preliminary report on the work and on more important results (excl. cruise III), by A. Bückmann has been published[1]).

Observations on catches have been collected to some extent also from a fishing-vessel belonging to the "Deutscher Seefischereiverein".

Norway.

The efforts of the "Fiskeridirektorat" are concentrated on enlarging our knowledge on the foundations of the fishery through annual cruises in coastal waters; during the year under review the following vessels have been commissioned: 1) M/S "Johan Hjort", which has recently been fitted with wireless telephone and central-heating; 2) M/C "Virgo" and four hired vessels, 3) R/C "Armauer Hansen" belonging to the Geophysical Institute, and the fishing cutters 4) "Solveig I", 5) "Eiken", and 6) "Huseland".

The "Johan Hjort" worked from 25th Jan. to 9th Feb., during the early winter-herring season, on the west coast with oceanography and echo-sounding for herring-shoals, continuing until 10th May northwards to "Fiskerhalvøen", when work was chiefly concentrated on oceanography and plankton in the Westfjord. The following two cruises had the object of investigating the occurrence of young-fish in deep as well as shallow waters, during July south of Bergen, from August to October northwards as far as Lyngenfjord in the Troms-area. Finally, during November—December, a cruise was made in the same fjord-area and as far as the bank area of Senja and Andøy for purpose of observing the occurrence of young herring and environmental conditions, in particular: oceanographic ones.

During the month of June a Dutch physicist had the opportunity of using the "Johan Hjort" for observations on the penetrating radiation in the deep water near Bergen.

Repeated series of oceanographical observations in the Troms-district fjords were organised by the Tromsø Museum (with assistance from the fishery research funds), which also made arrangements for three cruises with the Museum's research vessel to Westfinmark in April, May and June.

Unfortunately investigations in the eastern Finmark waters were made during April only (with the assistance of the "Johan Hjort") and the material, therefore, is not as complete as in the previous years, 1934—37, for an estimation of the immigration of fish.

[1]) "Deutsche Fischereiforschung im Nordostatlantik", Die Umschau, Jahrg. 42, H. 40, S. 911—15, Frankfurt a/ Main, 1938. See also this Vol., part III, App. 18: Erich Goedecke, Über jahreszeitliche Schwankungen im südlichen Barentsmeer und im Gebiet Lofoten—Bäreninsel—Spitzbergen.

OCEANOGRAPHY.

Spitsbergen Bank.

The Norwegian experimental fishing expedition with the cutter "Solveig I" made observations on the bank west of Spitsbergen from May to September.

The German trawler "Heinrich Baumgarten" visited the same area as well as the waters SE. of W.-Spitsbergen as far east as the Hope Island during October.

Bear Island.

Both above-named expeditions investigated the neighbourhood of the Bear Island during April, the English trawler in October.

Barents Sea.

The southern Barents Sea to Cape Kanin and Kolguev with the Skolpenbank and the Northern Deep was investigated during the first cruise of the German expedition (May, 1938).

East Finmark.

The coastal area was visited in April by "Johan Hjort" and intensely investigated.

To complete the periodical work of Norwegian research vessels in these waters, a permanent station was erected during 1938, for fortnightly observations at all standard depths. The position is situate at deep water close to Vardø and, like the three other permanent stations, fitted with 3 water bottles (with double thermometers), portable winch and meter-wheel.

It should be stated here, that it is very desirable if another permanent station could be erected at the other side of the Varanger estuary, e. g., off the western cape of the "Fiskerhalvø", near the Finnish port Vaitholahti.—If Finland could see its way to doing this, it would be possible throughout the year to follow the water movements in this important mixing region and thus, in time, build up a better foundation for the understanding of immigrating cod and capelin.

West-Finmark.

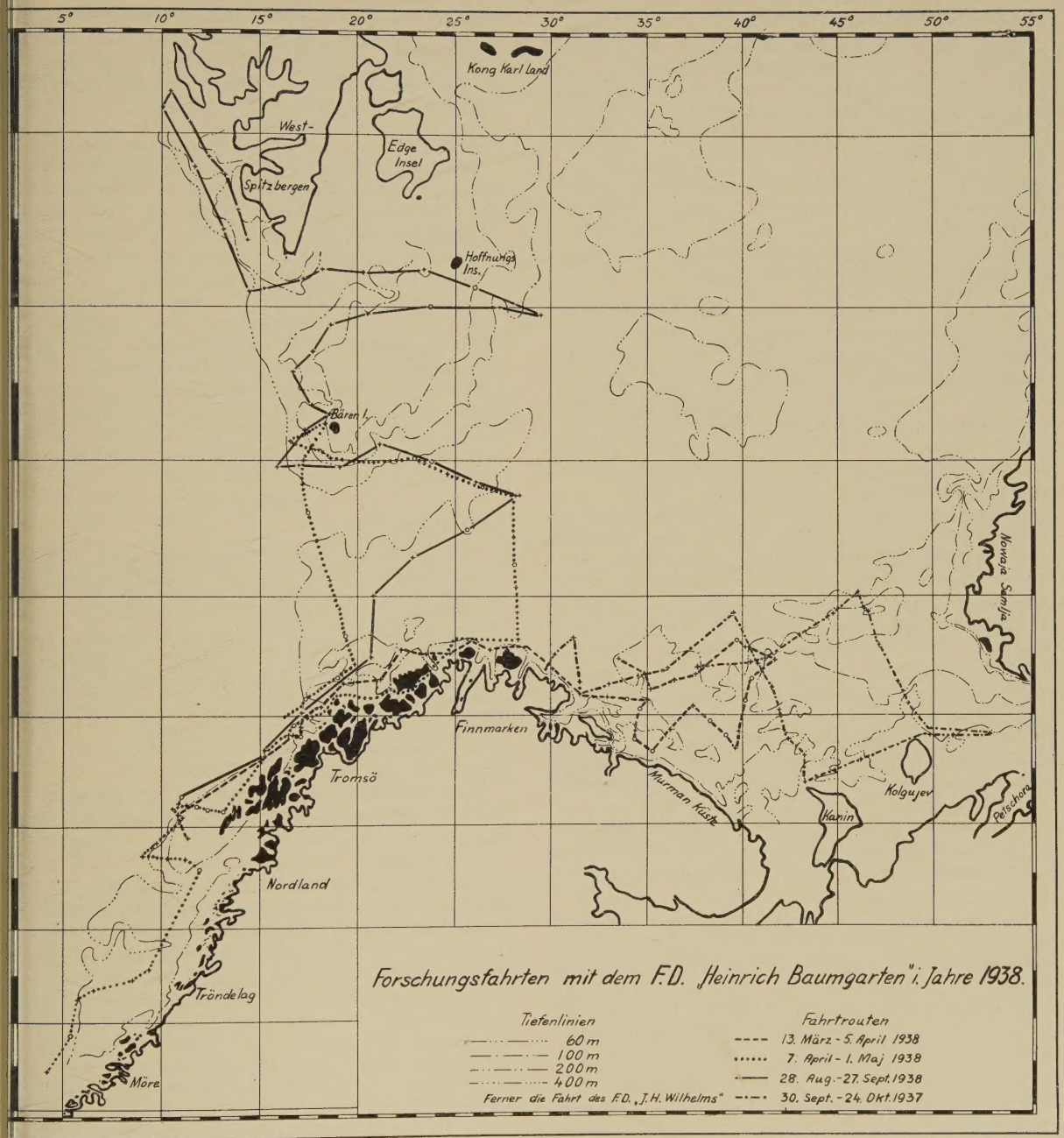
Simultaneous observations were made off the coast and in coastal waters by the German and the Tromsø Museum expeditions, respectively. Within this region the Ingøy permanent station has made fortnightly observations during the last 3 years.

Lofoten—Senja.

The German expedition passed this region three times (March, April, September), making observations each time. The "Johan Hjort" passed twice in March, and met the German expedition at Senja to discuss programmes and objects of work.

The Tromsø Fjord-Region.

Occasional observations were made by the "Eiken"



libut-expedition in March, more frequently in September and December during the visits of the "Johan ort". The fjords near to Tromsø were investigated veral times during summer by the Tromsø Museum peditions.

he Westfjord-Region.

The "Johan Hjort" made several cruises from late bruary to the middle of April in this region where the Skråva permanent station and the Eggum permanent station north of Lofoten have been worked now for 4 years.

Lofoten—Bergen.

The banks off Trøndelag, Helgeland and Salten were investigated by the German expedition during April; the coastal waters and many of the fjords by the "Johan Hjort" in February, May, August/September and November/December.

Westcoast (Stat—Stavanger).

From 25th January to 19th May the "Johan Hjort" and the "Armauer Hansen" undertook several short cruises to the coastal areas and into the fjords south of Bergen, occasionally assisted by the "Virgo".

N. North Sea.

A cruise on 2nd—5th April of the "Armauer Hansen" was badly hampered by the weather, but another by the chartered cutter "Huseland" succeeded in working two sections between the Norwegian coast, the Shetland and the Orkney Islands.

A total of 1200 serial stations were worked in the North-Eastern Area equalling about 12,000 observations of temperature and salinity. In addition the thermograph-service should be mentioned; during 4 years the temperature at about 3 m. depth has been recorded every fortnight along the entire liner-route Bergen—East Finmark, and twice weekly between Bergen and Oslo. Four times each year water samples have been collected on both routes.

In spite of the numerous observations the extensive North-Eastern Area cannot claim to be thoroughly or sufficiently investigated when considering that the occurrence of fish is chiefly depending on variations in and movements of different water masses and their mixing. It seems possible, and it is highly desirable that perceptible deficiencies could be mended by:

(1) More observations near Finmark and in the Barents Sea between April and June; this may soon be accomplished when the "Johan Hjort" obtains support from a similar vessel between October and April (during the summer it will be commissioned for Spitsbergen service).

A permanent station erected on the Finnish side of the Varanger estuary would assist in filling all gaps in periodical and occasional series of observations.

(2) More frequently repeated sections across the shelf off Møre, Lofoten and Vesterålen; this also may be possible when another Norwegian vessel is at disposal.

(3) Temperature observations from trawlers in the Barents Sea during the fishing and with simultaneous records of catches.

PLANKTON.

Germany.

During the cruises of the "Heinrich Baumgarten" plankton samples were collected by phytoplankton-nets, young-fish-nets and by the filter-method (cfr. "cruises").

Norway.

During most cruises hauls were regularly made at surface for eggs and fry and with the vertical net (silk 8). Within a certain number of fjords between Trondheim and Tromsø long-lasting hauls were made at 2—300 m. depth (February and March) with young-fish nets for halibut eggs; most hauls were successful but the sorting out of the eggs from the great quantities of plankton was very difficult. Notes on plankton, made on board, have been indexed.

Scotland.

During the two first weeks of April extraordinary large quantities of small herring larvae, 11—13 mm., were recorded just north of the 61° Lat., between Flugga and the Norwegian Deep. The occurrence of *Sagitta serratodentata* in this region confirms the inflow of Atlantic water during April.

The region off Egersund was characterized, in May, by a mixed plankton of some herring larvae and numerous *Calanus finmarchicus*, a few *C. hyperboreus*, *Rhincalanus*, *Sagitta serratodentata*, *Physophora* and *Thysanoessa*. In September, Salps and Doliolids were recorded W. and NW. of the Viking-bank, nearer the Deep. The plankton was more scarce, *Limacina* only appearing in numbers.

BIOLOGY.

Denmark.

Cod marked as follows were recaptured within the North-Eastern Area: — One marked at the Faroes on 5th April 1937, recaptured near the Bear Island on 21st November 1937.

One marked at SW. Greenland on 22nd September 1932, recaptured at Cape Kanin on 2nd March 1938.

In this connexion it may be mentioned also that a cod marked at Greenland has been recaptured at the Faroes.

England.

Cod marked at Spitsbergen during October 1937 have up to date resulted in 18 recaptures. The catches indicate spawning migrations via Bear Island to the Lofoten.

During October 1938 a voyage was made on board a trawler to the Bear Island grounds where 521 cod were marked. By the end of the year 5 recaptures had been recorded. Measurements were made and food and maturity investigated. A new method is being developed for the marking of cod from deep water.

Finland.

Herring. It should be recorded that the only herring factory east of Hammerfest exists on Finnish soil at the Varanger estuary; the best source of regular information as to presence of herring and capelin, therefore, would be this factory. It would be of great importance if arrangements could be made from the Finnish side for supplying relevant information on time and place from where raw material is obtained.

Germany.

At Wesermünde market the following measurements were made at the investigation of the "Arbeitsstelle für Fischereiforschung".

		Cod	Haddock	Saithe	Norway Haddock	Total
arents Sea	indv.	4,796	6,694	—	117	11,607
	kg.	14,050	10,860	—	200	25,110
	No. of samples	18	21	—	1	40
ear Island and Spitsbergen	indv.	6,265	4,222	318	1,578	12,383
	kg.	19,140	8,725	1,440	1,600	30,905
	No. of samples	20	17	2	9	48
orwegian coast	indv.	1,360	1,910	—	746	4,016
	kg.	5,540	4,400	—	1,050	10,990
	No. of samples	7	9	—	5	21
otal	indv.	12,421	12,826	318	2,441	28,006
	kg.	38,730	23,985	1,440	2,850	67,005
	No. of samples	45	47	2	15	109

Age Determinations. Material collected since 929 by Dr. LUNDBECK of **cod** otoliths and scales as been examined during 1937/38 with the assistance Dr. RIECH of the German research service. A report ill be submitted to the "Deutsche Wissenschaftliche ommission". The examination is being continued n statoliths and scales of cod, haddock and Norway addock from fishing vessels.

A report on length and age-composition of German ndings from the North-Eastern Area, 1929—38, v Dr. LUNDBECK, will appear as Appendix 1 in art III of the present volume.

As to the fishery Dr. LUNDBECK reports: — hanges observed in 1937, probably due to higher emperatures of water in general, have continued uring 1938. The yields at the Norwegian coast showed crease from the previous years. **Cod** and **haddock** nmigrated comparatively early and the fishing ason was prolonged while previously the emigra- ons from the grounds of German fishing activity ommenced already at the beginning of the spawning ason. In the Bear Island area the autumn yield of 938, like that of 1937, was less satisfactory. The shing fleet continued northwards along the west ast of Spitsbergen and the eastern edge of the itsbergen Bank as far as the Hope Island area. enerally speaking, however, they fished for **Norway addock** south of the Bear Island.

In the Barents Sea the fishery on more shallow ater started in June, but the yield was not great nd decreased further by the autumn. It appears that he **cod** stock is weak in the Barents Sea and near ear Island, while the **haddock** stock has been rengthened by younger fish.

o rway.

Cod measurements on landings during the hight the fishery season were continued in accordance ith customs for a range of years. In southern Norway he fishery for spawning cod has been poor for some ears, measurements were made at Bjørnsund only 3,085 indv.). In the Lofoten area a total of 70,780 dv. were measured between February and April four stations: Rinøy, Kabelvåg, Balstad and ærøy; 25,448 fish were measured at Andenes and ryllefjord (Senja) within the spawning-cod area N. of Lofoten. During the Finmark fishery, April—June, 64,802 fish were measured at Gåsøy, Mehamn, Berlevåg, and Vardø. The measurements thus total 163,195 in 1938 as against 175,361 during 1937.

In addition, 5,000 otoliths were collected with data on race and weight.

Vertebral counts total 7,293, 550 of which on larger fish from Møre, Lofoten, and Senja, and 6,743 on young fish caught at all depths, partly by shore seines, partly by shrimp trawls.

Haddock measurements were limited to 1,448 at Vardø (Finmark) during June.

Saithe, unfortunately, has not been subject to the attention it deserves; 929 fish were measured at Andenes.

Halibut. Due to the recent alarming reduction of the halibut stock it is considered desirable to obtain more extensive data on this important species, and the research work commenced in 1937 has been continued. During a cruise with the hired cutter "Fiken", experimental fishery was undertaken between 20th January and 20th April in the Troms—Finmark district; 314 fish were marked from the "Fiken" in addition to 94 from a trawler in the Spitsbergen region.

Material for age and race determinations was collected from 1,357 fish.

Plaice. A rich material of young fish was caught by the "Johan Hjort" on the July cruise along the south and west coast. Otoliths were collected from about 1,500 larger fish, with data on vertebrae. The results of these investigations have caused new fishing regulations to be proposed.

Research on the effect of artificial hatching of plaice has been continued; ten million hybrids from female plaice and male flounder were liberated during 1938, within the closed Borgenfjord (a minor branch of the Trondheimfjord). When searching later on for young fish (with shore-seine) the catches by the end of the year contained 96 % hybrids. Corresponding figures from previous years are: —

	Liberated	Hybrid-percentage of Catch during following Autumn
1935	2 mill.	1·5 %
1936	13 -	30 %
1937	7 -	0·5 %

At the Biological Station at Trondheim experiments were made by Mr. Rollefsen on rearing of young **plaice** from the egg- to the bottom stage; some 50 % were successfully reared the larvae being fed on nauplii of the salt-water crustacean *Artemia*.

Herring. Work on biological statistics concerning the herring stock has been continued along customary lines of many years. 30 samples of small herring (ripe or spawning) were examined as to fat content, 37 samples as to age, maturity, length, and weight: — Vertebrae were counted on the entire winter herring material, on almost all small-herring samples and on six fat-herring samples.

Whenever weather permitted search, echo-sounding for herring shoals was carried out off the coast by the end of December, 1937, and during January and February, 1939.

The most important spawning grounds of the southern spring herring area were localized and plotted on charts with results of echo records.

The fat content was subject to continued investigation throughout all fishing seasons.

Sprat. 75 samples caught by the usual bag-net were examined as to age, maturity, length and weight, and most of the samples as to fat content as well. Three young-fish samples were subject to vertebral counts.

Salmon and Trout. The report on salmon and trout has been recorded in the report of the Salmon and Trout Committee, in page 78.

OTHER INVESTIGATIONS.

Norway.

Aquarium technics. Mr. G. Rollefsen has succeeded in keeping indoor sea water aquariums going without air supply and filtering by introducing the bottom alga *Enteromorpha intestinalis*.

Norwegian Literature.

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3) Eggvin, Jens. The Bottom Temperatures. Ibidem.
4) — Trekk av Nordnorges Oceanografi etc. Ibid., No. 4. (English Résumé).
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6) Lunde, Gulbrand, og Sigurd Lunde. Undersøkelser over forekomsten av Carrageen. Fiskeridir. Skr., V, 5.
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8) Rollefsen, Gunnar. Skreiens Alder (1938). Årsber. vedk. Norges Fiskerier, 1938, No. 2.
9) Sivertsen, Erling. Forholdet mellem spiss- og bredsnutet ål og deres næring. Fiskeridir. Skr., V, 8 (1938).
10) Sund, Oscar. Merkning av Torsk. Fiskeridir. Skr., V, 4. (English Résumé).
11) — Torskebestanden i 1937. Ibidem. (English Résumé)
12) — Sildeundersøkelser i 1938. Årsber. vedk. Norges Fiskerier, 1938, No. 5.
13) — Torskebestanden i 1938. Ibid., No. 2.

A special publication of the series Fiskeridir. Skr. is in the press giving full summaries of the papers mentioned under 5), 8), 12), and 13).

NORTH-WESTERN AREA COMMITTEE

1938.

By

Å. Vedel Tåning.

During 1938 the Iceland Government joined the International Council as a member and the adhesion of this country to the Council as an active member will be of great importance, especially to the work carried out in the North-Western Area; it is obviously of great value for the investigations in this area, that research work will be carried out also outside the spring and summer seasons by regular cruises under scientific supervision. Already during 1938 three cruises have been undertaken in Icelandic waters by the Icelandic patrol vessel "Þor", and the institution of a special department for fishery research work at the University of Reykjavik has secured application of the observations and material collected.

During 1938, the Committee has continued work according to the programme of the Committee followed for some years. Moreover a few important new subjects have occupied research vessels and laboratory work of some of the participating countries, viz. 1) the proposed closure of Faxa Bay[1]) and of certain areas off the Faroes, and 2) the international Gulf Stream survey. As to the first mentioned subject especially Iceland and Denmark have organized and carried out the collection and preparation of numerous data from the area, and concerning the second subject Iceland, Scotland and Denmark have made observations at fixed sections of numerous hydrographical stations in the North-Western Area during the months of June—July.

The important species of fish in the area have been studied as usual, especially with a view to follow the fluctuations within the stocks. Details are given in the various reports. Especially the stock of Cod—the most important of the five principal species studied—has been followed. For the fishery an increase in the yield of the Cod fishery was observed in the Greenland area owing to some good year-classes entering the fishery; a slight improvement was observed in the Iceland area also occasioned by certain new year-classes; the stock of Cod in the Faroe area showed—after several bad years—a single good young year-class which may be of importance for a few years to come, especially because the trawling intensity has decreased much in recent years.

The following vessels have carried out research work in the area: from *Denmark* the research vessel "Dana" has operated in the whole area except in Greenland waters; in these the M/B "Umarissok" and H.M.S. "Heimdal" have operated; moreover H.M.S. "Hvidbjørnen" has carried out work in Iceland waters; from *France* the despatch vessel "Ville d'Ys" has operated in West-Greenland waters; from *Iceland* the patrol vessel "Þor" undertook three cruises off Iceland and in the Denmark Strait, and the M/S "Sæbjörg" off North Iceland; from *Scotland* the research vessel "Explorer" operated in the Faroese waters and carried out work in the waters west and north-west of the Faroe area in connexion with the Gulf Stream survey.

Several special observations were however also secured by *Denmark*, *Germany*, *Iceland* and *Norway* by means of fishing vessels, liners etc.

Hydrographical and *plankton* observations secured in the area will be reported by the respective Committees, and the *Bulletin Hydrographique* will publish the hydrographical observations from the area.

Denmark.

Cruises to the area were carried out during 1938 by the "Dana". The vessel operated in the *Faroe Area* from May 3rd to 18th and from July 24th to August 5th; carried out Denmark's share in the *Gulf Stream Survey* from June 20th to July 6th; and operated in *Iceland* waters from July 11th to 23rd. Several special collections and observations were secured by means of other vessels, e. g. patrol vessels, motor boats etc.

[1]) See preliminary report by the Committee on p. 20.

Faroe waters.

Ordinary routine work was carried out in the area, viz., trawling, tow-netting, bottom sampling etc.

Cod. A survey of the distribution of eggs and small larvae was carried out in May. Material from commercial catches for the study of fluctuations in the stock was secured, a total of about 8,000 measurements and 900 samples of otoliths was collected during the spring fishery. A study of the average sizes of the younger age-groups has revealed that the average size has decreased during 1937 and 1938. Various other investigations on the cod have been carried out concerning the proposed closure of certain areas off the islands.

Haddock. Material of samples of scales and measurements was secured and handed over to the Aberdeen Laboratory. A small sample was caught at the Lousy Bank, where trawlers working were observed late in June.

Halibut. Commercial catches of halibut have been measured and otolith samples secured from about 150 specimens. A large proportion of the commercially fished halibut proved to be less than 80 cm. in length (less than about 5 kg. in weight), viz., 42 % (as against 11·5 % only in Greenland waters). Measurements and sampling of otoliths will be continued. Unexpected results of marking experiments on small halibut have been obtained, showing that many small halibut about 50—70 cm. leave the Faroe area (see a preliminary report in *Journal du Conseil*, XIII, 1938 p. 370 et seq.).

Herring and **Sprat.** Pelagic stramin-net hauls during the month of May showed that herring larvae as usual at this season were present in small numbers, about 30 specimens per hour being captured. Small larvae of sprat were again present inside the fjords only.

Lemon Sole. Measurements and samples of scales were collected in the fjords and on the banks; the material has been treated by Dr. B. Rae, who gives the results in two papers annexed to this report (see Appendices 2 and 3 in part III).

Norway Haddock. Several investigations of this species were carried out during the cruises in Faroese waters in May and July—August. Both distribution of larvae and adults was studied and material for a general study of the two species present (*Sebastes marinus* and *S. viviparus*) was secured. The larger species is not very common, the smaller however very common, from coastal waters to a depth of about 400 metres. Very few small specimens of *Sebastes marinus* were recorded in trawl catches. Systematic studies of the various characters showed that the two species are easily separated; also the young larval stages are different and easily distinguishable in pelagic samples, as the smaller species has a melanophor infracaudally, not present in the larger species.

Other species. All material of Tusk, Ling, Plaice and several other species was secured for further studies.

Moreover material of the Norway Lobster was secured as a supplement to the material collected during 1937.

Whales. During the year the following numbers of different species of whales were caught from the two whaling stations at the Faroes:

183 fin whales, 5 sei whales, 2 blue whales, 2 humpbacks and 7 sperm whales.

The Ca'ing whale (Blackfish) was captured by the natives in the fjords as usual (2072 specimens).

Hydrographical observations were made at most localities operated, and a general survey of the section North Uinst—Nolsø was carried out on May 3rd to 4th; a few stations were operated in the Faroe—Shetland Channel in August also. The Myggenæs station has been operated as previously.

The international Gulf Stream Survey.

The share of Denmark was carried out from June 20th, when Bull Rock light house was passed, to July 6th, when the vessel called at Reykjavik. The route followed will be seen on the annexed sketch map. Though hydrographical observations were the main object of the cruise, several observations were secured on other lines also.

Stramin-nets were towed and other pelagic work was carried out; 300 surface current bottles were liberated in groups of 25, several recoveries being obtained (14). Much information was secured on the south-eastern boundary of the spawning area of *Sebastes marinus*; pelagic larval stages were not caught south of about 60° Lat. N. (farther west however, the species has been recorded also south of this latitude during earlier cruises). As soon as the vessel struck the chain of banks running south-west from the Faroes the larvae of *Sebastes marinus* disappeared, those of the smaller species substituting them.

The sketch map gives further particulars and shows moreover where larval stages of the **Common eel** (unmetamorphosed) were recorded; very few records are at hand from the waters west of the Rockall area. Several other observations of pelagic animal life showed that a line roughly running from the Faroes over the Faroe-, Bill Bailey and Lousy Banks form a boundary of different pelagic animal communities. The area deserves a much closer investigation than has been carried out up to now.

Icelandic waters.

During the summer "Dana" carried out a circumnavigation of Iceland in mid-July. Moreover trawling operations and other routine work were carried out at the fixed stations in the Faxa Bay. Several observations were obtained from Danish patrol vessels partly in collaboration with the Icelandic patrol vessel.

Cod. In the spring about 400 spawning cod were marked off south-west Iceland, about 4 % have been recaptured during 1938; one of the cod marked has emigrated to West-Greenland, being recorded there 183 days after liberation. During the year not less than 35 cod marked in Greenland waters have been recaptured

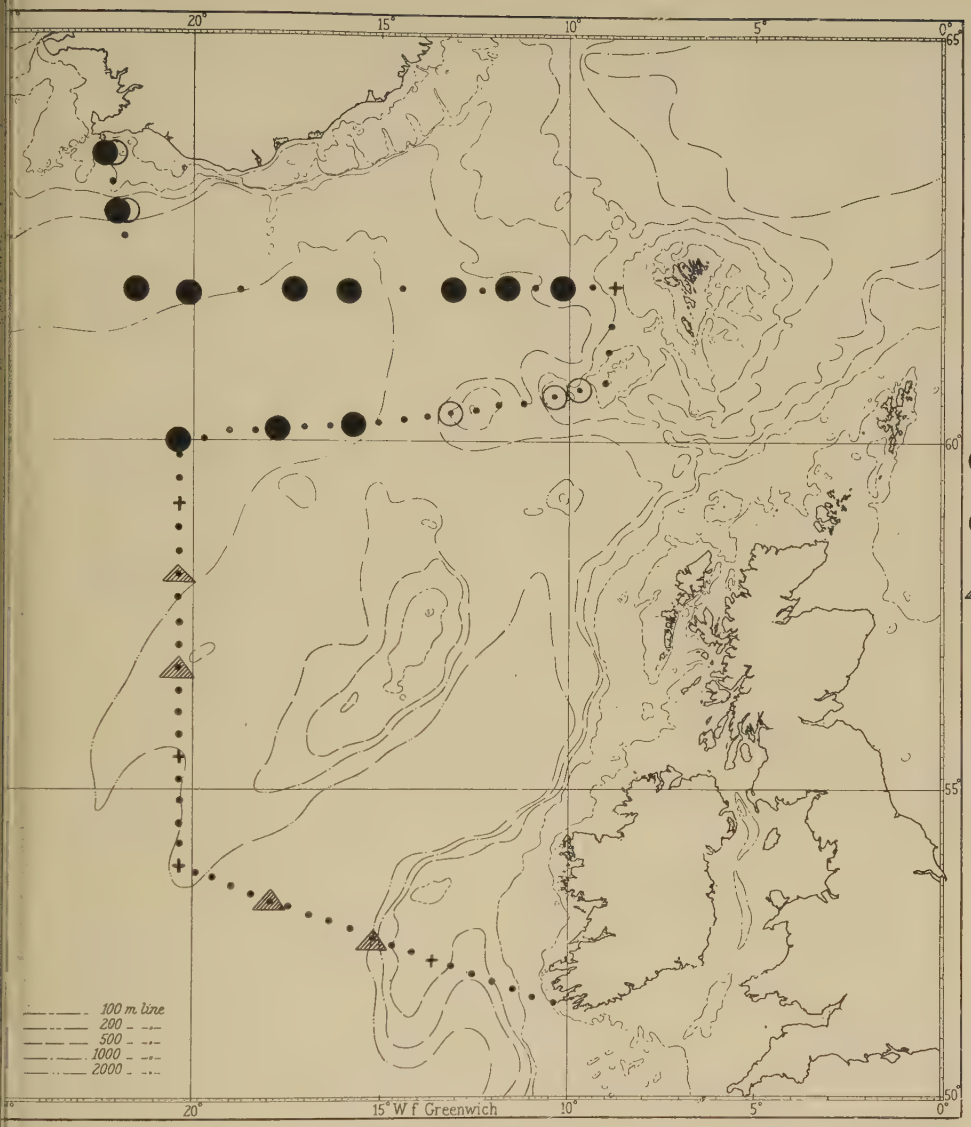

Fig. 1.

● *Sebastes marinus* larval stages.

○ *Sebastes viviparus* larval stages.

△ Eel larvae.

\+ Stramin-net hauls; larvae of *Sebastes* and *Anguilla* absent.

° Hydr., Plankton stations.

Iceland, the number of recaptures being higher
n during the preceding two years which showed
y few emigrants to Icelandic waters (in 1936 and
37 12 and 5 respectively). Most of the immigrants
re marked at South Greenland during 1937.
Material for age-determination etc. was collected
several localities. The drift of cod fry was studied
nd Iceland (this year, however, not in the Den-
rk Strait); the north coast was blocked in 1938
cold water and the distribution of fry accordingly
fered from the usual along the north coast. A review
the question will be given later on.

Haddock. The anticyclonic drift of fry was studied
m net towings, no fry was being recorded in the
d water off the north-west and north coast. Material
age assessment was collected and handed over to
Aberdeen Laboratory.

Plaice. Age-determinations were carried out showing the year-classes 1933 and 1935 to be best.

Marking experiments on 300 specimens were carried out in the Faxa Bay at the territorial and the extra-territorial fixed stations, the results confirming those carried out in 1932, viz., that the percentage of recaptures is increasing in territorial waters, and moreover decreasing for British, increasing for Icelandic fishing vessels.

Halibut. Various material was collected for age-determination etc. A few small halibut (53) were marked in the Faxa Bay, about 10 % being recaptured during the following 6 months, all inside the Bay.

Herring. Three samples of young spring- and summer-spawning herring have been examined as to racial characters (2 samples with specimens belonging to the 0-group, 1 sample of nearly one-year-old

herring). From their size at this stage of development the two races of herring are easily distinguished in Icelandic waters. The results are given below and it is of interest to see that the average number of vertebrae in these quite young herring is equal to that recorded by RUNNSTRÖM[1]) in mature herring a few years ago, but lower than the value found by JOHANSEN[2]) in 1919—1924 (this is also emphasized by RUNNSTRÖM 1936). The samples from Hvalfjord have been received from Mr. ÁRNI FRIÐRIKSSON.

Spring-spawning Herring:

Hornafjord, E.-Iceland. $^{14-15}/_{8}$ 36 (size 46—89 mm.)		Hvalfjord, W.-Iceland $^{24}/_{2}$ 1936 (73—126 mm.)
No. of vertebrae	No. of specimens	No. of specimens
59	1	1
58	44	60
57	108	87
56	14	11
Total...	167	Total... 159
Average = *57·19*		Average = *57·32*

Previous records { JOHANSEN (1926): 1924: *57·48—57·49.* RUNNSTRÖM (1936): 1933: *57·20.*

Summer-spawning Herring:

Hvalfjord, W-Iceland $^{14}/_{2}$ 1936 (size 41—54 mm.)	
No. of vertebrae	No. of specimens
59	3
58	17
57	106
56	34
Total...	160
Average = *56·93*	

Previous records { JOHANSEN (1926): 1919: *57·01—57·07.* RUNNSTRÖM (1936): 1932: *56·96.*

Other species. All material from trawlings, tow-netting etc. has been measured as usual.

Deep-sea prawn (Pandalus). Off Eyjafjördur (North Iceland) a rich haul of deep-sea prawns was secured at a depth of 360 m. (66°18.7′ N. 18°36′ W.), the species being common in this area.

Plankton and **hydrographical observations** were carried out as part of the routine work during the "Dana"s cruise, and hydrographical sections secured during the year in collaboration with Iceland (see reports of the special committees).

Denmark Strait.

A planned cruise to East Greenland during the month of July had to be abandoned also in 1938.

[1]) Rapp. et Proc.-Verb., Vol. No. 99, IV, p. 5, 1936.
[2]) ibid. Vol. No. 39, p. 127, 1926.

West-Greenland.

1) Coastal waters: Professor AD. S. JENSEN, Fishery adviser to the "Grønlands Styrelse", has reported on the work carried out in the coastal waters of West-Greenland during the year 1938.

As in 1937 the fishery investigations have been carried out from May to October by Mr. PAUL M. HANSEN from the M/B "Umarissok". The motorboat has operated in the coastal waters between Egedesminde (at ca. 69° N. Lat.) and the southern part of the Julianehaab district (at ca. 60° N. Lat.).

Cod. The distribution of pelagic cod larvae in the area was surveyed by means of the 1-m. stramin-net with 100 and 50 metres of wire out. At the same suitable localities as in 1937 the eel-seine was used to catch the three youngest age-groups of cod. Moreover small cod were obtained from the commercial catches with prawn-trawl at depths of 400—600 m. in the Amerdlokfjord at Holsteinsborg. Some 5000 young cod were measured. Samples of about 300 otoliths of these young cod have been collected. Samples of otoliths of the older age-groups of cod have been secured, partly during fishing operations from the "Umarissok" and partly from commercial catches landed at the various fishing ports in the southern West Greenland. A total of more than 3000 samples were secured and analysed throughout the fishing season, all cod being measured and the sex determined. Various of the younger year-classes of cod are of importance, viz., 1932, 1931 and 1934 (by order of importance)[1]).

A total of 838 cod have been marked and liberated in the Godthaab, Frederikshaab and Julianehaab districts.

Halibut. Otoliths were collected from commercial catches landed at the fisheries station of Kângâmiut; a total of some 300 samples were collected and analysed, all fish being measured and weighed. The most important year-classes are at present (by order of importance) as follows: 1926, 1929, 1931 and 1924.

Due to very stormy weather and ice the planned experiments with long lines in the Lichtenaufjord (Julianehaab district) have been very restricted and it has been possible to mark the small number of 26 **Greenland halibut** only. The stock of this fish in Lichtenaufjord has increased during the last two years and a fishery has been carried out during the summer. About 25 % of 100 marked Greenland halibut have been recaptured here.

Salmon (*Salmo salar*). Young specimens have been taken with the eel hand-seine in a lake at Kapisigdlit in the innermost part of the Godthaabfjord and at the same locality a few measurements and scale samples have been obtained from adult salmons caught by the Greenlanders.

Char (*Salmo alpinus*). In the Godthaab and Julianehaab districts some 300 were measured and about 150 samples of otoliths taken.

Herring. 200 herring were measured in the Sukker

[1]) See Appendix No. 8, in part III.

ppen district and some 3000 in the Julianehaab strict. Samples of scales and otoliths from the arious catches were taken. The herring seemed to cur in smaller numbers than in previous years.

Uvak (*Gadus ogac*). Only 70 specimens from the ulianehaab district have been age-determined (the oliths being used). The year-classes 1929 and 1931 e predominant as in 1937.

Of *Pandalus borealis* 1100 specimens from commercial catches with shrimp-trawl in Amerdlokfjord ve been measured and sexed. Eggs of the Greenand crab (*Chionoecetes opilio*) and the prawn *Spirontaris macilenta* have been successfully hatched; a scription of the stages will be published.

In all the principal localities in which the "Umassok" operated the water temperature from the rface to 500 metres was recorded.

The temperature, especially in the deeper water yers, was much *lower* than during the previous ars.

2) Offshore waters: **Cod.** On the offshore banks 0 specimens of cod were marked and liberated from Faroe motor cutter. Cod measurements were secured m the banks also, 2300 measurements of which 0 with otolith samples. Several emigrants to Icend (35) were recorded during the year (see above) d also a few migrating much longer, viz., one to e Faroes and one to the Barents Sea. A total of recaptures was recorded from the Greenland waters oper.

Halibut. From the commercial fishery carried out the offshore banks during July to September 4377 easurements (of which 323 with otolith samples) ere secured; only 11·5 % being less than 80 cm. tal length.

Whales. 8 whales only were caught by the whaling at "Sonja" (7 fin whales and 1 humpback).

Hydrographical observations: Routine stations off e west coast were operated by the Danish inspection ssel during the summer. As to observations in astal waters see above.

Éire. (P. G. Farran).

No work has been carried out in the area during 38.

England. (E. S. Russell).

No work has been carried out in the area during 38.

France. (Ed. le Danois).

The despatch-vessel "Ville d'Ys" operated several drographical stations in the Davis Strait as far rth as north of the Disco Isl. during June—July bservations published in the Bull. Hydrogr. for 1938 gether with those from the New Foundland area cured during April—May); biological routine work as not carried out during the cruise.

Germany. (A. Hagmeier).

The "Hydrobiologische Abteilung des Hamburgischen Zoologischen Museums und Institutes" (Prof. E. Hentschel) has during the year collected plankton samples at Iceland. Prof. Hentschel carried out a circumnavigation of Iceland during April and investigated from quantitative surface samples ("Siebproben") the occurrence of plankton on all coasts of the island. Plankton from Siglufjord was secured twice daily during eleven days. From the mouth of the Elbe to Iceland and back again samples of plankton from 5 litre surface water were moreover secured rather regularly every 1—2 hours.

During the Gulf Stream cruises of the "Dana" and of the "Explorer" similar samples of surface plankton were secured in the month of June to the benefit of the "Hydrobiologische Abteilung". The results will be published in a general review of the plankton of the north-western Atlantic.

The "Arbeitsstelle für Fischereiforschung der Staatlichen Biologischen Anstalt auf Helgoland und des Instituts für Seefischerei in Wesermünde" (Dr. J. Lundbeck) has continued market measurements from German trawlers fishing at Iceland. Samples of otoliths and scales were secured in small numbers only during the year and age-determinations have not yet been carried out. The following measurements were secured.

	No. of samples	No. of specimens	Weight in kg.
Cod	32	7,450	29,840
Haddock	15	4,494	8,983
Saithe	15	2,967	12,140
Norway Haddock	13	1,905	3,025
Other species	1	125	27
Total	76	16,941	54,015

Holland. (J. J. Tesch).

No work has been carried out in the Area during 1938.

Iceland. (Árni Friðriksson).

The marine investigations carried out in Iceland waters have been organized by the Fishery Department of the University Research Institute.

Work at Sea.

Three trawling cruises with the "Þor" have been carried out in Faxa Bay, the first on February 13th—18th, the second on June 22nd—24th, and the third on December 13th—16th. In addition, fishing experiments were carried out on April 12th—17th on different deep-sea banks off the SW.- and NW.-coast. Finally, a cruise in the Denmark Strait took place in the last days of June on which Iceland's share of the international Gulf Stream survey was carried out, the hydrographical data being handed over to the Hydrographical Laboratory in Copenhagen.

Another patrol vessel, viz., the M/S "Sæbjörg", was commissioned for research work off the north coast; during this cruise plankton samples were collected and experiments on registering herring shoals with a Marcony-metrograph were tried but without results.

Cod. About 31,380 cod from the commercial fishery and from the cruises of the "Þor" were measured and about 4,000 age analyses carried out. On the banks off the south and south-west coasts, where the great fishery on spawning cod takes place in the months January—May, some new year-classes appeared, thus the year-brood 1930, now 8 years old,

Fig. 2. "Þor" 1938. Localities of Trawling.

represented about one third of the landings. In order to show the predominance of the new year-classes the results of the age-determinations can be summarized as follows:

Locality	≤ 8 years	> 8 years
Hornafjord, SE.-coast	65·7 %	34·3 %
Westm. Isls. S.-coast	34·9 %	65·1 %
Keflavik, SW.-coast	49·4 %	50·6 %

Material from samples of long-line caught cod only is included in the survey. The old year-classes 1922, 1924 and 1926 were however found in considerable numbers especially at the Westmanna Isls., where they amounted to about 13·0, 17·3 and 13·3 % respectively. In the cold water area, off the NW.-, N.- and E.-coasts, fish were plentiful on the banks during the summer and the autumn, with the following percentages of young year-classes predominating:

Year-class	NW.-coast	N.-coast	E.-coast
1934	27·1	27·7	26·0
1933	17·3	28·2	10·4
1932	7·1	6·4	9·8
1931	8·7	13·3	9·2
Other year-classes	39·8	24·4	44·6
Total	100·0	100·0	100·0

Comparing these results with those from previous years, it is obvious, that the year-class 1934 seems to be good; the same was the case with the 1931-brood, although it does not appear from the samples reviewed above.

Herring. About 8,000 herring were measured, 6,800 of which on the N.-coast during the summer. The stage of maturity, intestine-fat and weights were secured from the greater part of this material. 14 samples of scales (of 1,400 specimens) were taken for later age-determination. Vertebrae were counted on 4,600 herring in connexion with the determination of the stage of maturity. By far the greatest part of this material was spring spawning herring fished during the summer months off the N.-coast. The vertebrae counts showed a considerably lower number than those found by A. C. Johansen and Sv. Runnström. The results will be published later on with the results of the age-analyses when finished.

Haddock. 1,100 age-analyses and measurements have been carried out at the Westmanna Isls. showing that 74 % of the various catches belong to the year-class 1936. A similar result was obtained from age-analyses of several samples, comprising a total of 3,000 specimens from the Faxa Bay. Almost everywhere at Iceland this year-class was very clearly predominant, surpassing 90 % of the total catches; excepted, however, the southern part of the Bay in December, where 80 % of the total analysed belonged to the year-class 1937. All samples in Faxa Bay were secured by "Þor".

Capelin (*Mallotus*). 1,500 specimens from Keflavik (SW.-coast) were measured, weighed and sexed; from 575 specimens the number of vertebrae was counted and otoliths secured. The age-determinations have not yet been carried out, the average *number of vertebrae* was found to be 69·48 ± 0·039.

Saithe. 104 specimens from the Westmanna Isls. were measured and age-determined, the result being that 35·5 % belonged to the year-class 1928, 13·6 % to the year-class 1927 and 10·6 % to the year-class 1925.

Plaice. 500 otoliths with corresponding measurements have been secured from the NW.-coast for age-determination later.

Salmon and **Trout.** About 500 samples of salmon scales have been collected, mainly from the Ellida-

ver in the vicinity of Reykjavik. Thorough investi-
ations on 500 specimens of *Salmo alpinus* forma
urta from the Thingvalla-lake were carried out,
ertebrae countings made and scales and otoliths
cured. About 270 *Salmo alpinus* f. *typica* were
eated in the same way; the age-determinations
ill subsequently be carried out.

Plankton. More than 300 plankton samples were
cured with Professor Hardy's Plankton Indicator,
ainly off the north coast. The results from this
aterial will be published later on with those of
veral samples from vertical Hensen-net hauls
cured also off the north coast at different hours
the day in order to study the vertical migration
the zoo-plankton during the light-season of the
ar.

About 2600 herring stomachs from herrings caught
f the N.-coast were examined with very good results
regards the relation between the volume of the
od contained per stomach and the yield of the
hery per unit of gear. Dr. FINNUR GUÐMUNDSSON
as made 14 cruises to the Westmanna Isls. during
e year in order to study the quantitative and
alitative composition of the Plankton by means
the method devised by Professor HENTSCHEL,
amburg. Investigations have been carried out at
localities on this route; the material being treated
w.

Several other investigations have been carried out,
g., measurements of different fish, collecting of
ales and otoliths, investigations on *Pandalus* and
ephrops, temperature measurements etc.

Norway. (O. SUND).

The Fisheries Directorate maintained the thermo-
aph service between Bergen and Iceland, the S/S
Lyra" running every forthnight between Bergen
d Reykjavik via the Faroes, and the S/S "Nova"
aking a trip monthly (except the months November
-March) from Bergen to East-Iceland, thence round
e island to Reykjavik, returning directly to Bergen.
e results are published in the *Bulletin Hydrogra-
ique* in a graphical form. Water samples have
en collected 4 times during the year.

The Geophysical Institute, Bergen, carried out
ring the summer Norway's share of the general
lf Stream survey.

Scotland. (R. S. CLARK).

ork at Sea.

During the second half of June, the "Explorer"
vestigated, largely from a hydrographic standpoint,
triangular series of stations in the North-East
lantic along the lines from Skerryvore to Rockall
d longitude 18° W., thence northwards to latitude
° N. to a point roughly 30 miles from the south
ast of Iceland and from this point to the Sound
of Harris, over the Outer Bailey and Rosemary Banks. This survey formed part of an International investigation of Gulf Stream waters, and the results will be published separately. On this cruise a small amount of plankton work was carried out, consisting chiefly of surface samples, while a trawl haul was effected on Rockall Bank.

The usual Faroe—Shetland cruise followed at the end of June and during the first week of July, the more southerly traverse from the Butt of Lewis to Faroe Bank (south of the Wyville Thomson Ridge) being accomplished first. General observations were then carried out round the Faroes, and the vessel completed a line of hydrographic and plankton stations between Nolsø and Flugga.

Hydrography.

Surface drift bottles in groups of ten were liberated at most of the stations. Recoveries at the end of January 1939 were remarkably few. Conditions in the Faroe—Shetland Channel were sub-normal at the end of June and beginning of July and indicated considerable restriction and "falling off" of the Atlantic current since the early part of the year when a relatively strong pulsation into the North Sea was observed at the northern gateway between Shetland and Norway at the end of March.

Plankton.

No Clupeoid larvae were observed in the collections round the Faroes in July, but sampling with horizontal and vertical nets was not carried out on the same extensive scale as in recent years. The general plankton collections from north and west of the Faroes were extremely poor, but an abundance of Calanus was observed on the eastern side of the Islands, where also three species of Sagitta, namely, *S. elegans arctica*, *S. maxima*, and *S. lyra* were obtained. Rich general plankton was encountered in the Faroe—Shetland Channel, especially on the eastern boundary but was definitely scarcer on the western side and on Faroe Bank. A few individuals of *Salpa zonaria* were obtained immediately to the south of Wyville Thomson Ridge at the beginning of July, while about the same time, Doliolids and Fierasfer larvae (*F. dentatus*) were taken north of the Butt of Lewis. *Salpa fusiformis* appeared in small numbers on the plateau west of the Hebrides in August, and again in September at the northern gateway to the North Sea, but was not taken in the Faroe—Shetland region in July month. Haddock larvae were present in the collections round Faroe and on Faroe Bank.

Trawling.

A single haul of one hour's duration with the commercial otter trawl plus a small-meshed covering over the cod-end on Rockall Bank gave the following results. The position was 57°26′ N. 13°35′ W., the depth 175 metres and the date 16th June 1938.

	Ordinary Mesh (24 rows to the yard)		Small Mesh (escapes into bag)	
	No.	Range in cm.	No.	Range in cm.
Lemon Sole.....	8	20—31	5	9—20
Megrim.....	129	20—57	77	11—25
Haddock.....	171	24—51	24	15—27
Gadus poutassou ..	2	30—32	2	20—28
Tusk	2	39—54	—	—
Gadus minutus ...	—	—	15	17—26
Raia clavata.....	5	46—57 (width of disc)	—	—
Raia fullonica	1	41	—	—
Angler.....	3	49—83	1	9
Gurnard	6	25—37	—	—
Argentina.....	2	22—24	288	9—28
Sebastes	2	24—28	13	10—17

The invertebrates brought up in this haul consisted of Cucumaria, *Echinus norvegicus*, *Scaphander lignarius*, *Henricia abyssicola*, *Lithodes maia*, *Eupagurus cuanensis*, *Pandalus Montagui*, *Palmipes membranaceus*, *Strongylocentrotus drøbachiensis*, and Ophiuroids.

A single trawl haul on Faroe Bank gave a fair catch of Haddock, Cod and Common Dabs, along with a few Halibut (ranging from 40 to 72 cm.), Lemon Soles and Megrim. Hauls off Suderø, Myggenæs and Svinø were extremely poor, the catches consisting of small numbers of Cod and Haddock. Off Fuglø, however, a rich haul of Haddock was obtained. At the time of the "Explorer"'s visit, a considerable fleet of commercial trawlers was operating at this locality and good catches of haddock were secured.

Three papers on work carried out in the Faroe Area are included in the "Appendices", viz., two by Dr. B. B. Rae on the Faroe stock of Lemon Sole and the food of Lemon Sole, one by Dr. Henry Wood on some samples of Faroe Herring. (App. Nos. 2, 3 and 4, respectively, in part III).

Sweden. (K. A. Andersson).

No work has been carried out in the area during 1938.

Literature.

Paul M. Hansen: Fiskeriundersøgelser ved Vest-Grønland i 1937. Beret. vedr. Grønlands Styrelse. København 1938. Nr. 1, pp. 34—56.

P. Jespersen: Statistical survey of the Halibut Fishery in the waters round the Faroes, Iceland and Greenland. Medd. Komm. Danmarks Fiskeri- og Havunders. Ser. Fiskeri Bd. X, 5. København 1938.

Helge Thomsen: Hydrography of Icelandic Waters. The Zoology of Iceland. Vol. I, 4. København 1938.

Å. Vedel Tåning: A method for cutting sections of otoliths of Cod and other Fish. Journal du Conseil. XIII, p. 213. 1938.

— Migrations of small Halibut marked in Faroese Waters. ibid. XIII, p. 370. 1938.

H. Ussing: The Biology of some important Plankton Animals in the Fjords of East Greenland. Medd. om Grønland, Bd. 100, 1938.

In "The Zoology of Iceland" papers on the following groups have been issued:

Hydroida, Ostracoda, Cladocera, Euphausiacea, Mysidacea, Cumacea, Nebaliacea, Cirripedia, Chaetognatha, Hirudinea, Turbellaria, Gastropoda, Opisthobranchiata, Brachiopoda.

Report by the Sub-Committee on the Faxa Bay Question.

By

Å. Vedel Tåning.

According to recommendation 2) of the meeting in May 1938 the Chairman convened a small meeting on March 17th—20th 1939, to consider the progress so far obtained and preparing programme for work.

The meeting was opened by the Chairman and the 1st sitting took place on Friday March 17th at 10 o'clock a.m. at Charlottenlund Slot, Denmark. Present were Dr. Å. Vedel Tåning (Chairman), Mr. Á. Friðriksson (Secretary), Prof. Joh. Hjort (partly), Mr. M. Graham and the Administrative Secretary Capt. Nellemose (partly), the members representing England, Iceland, Norway and Denmark.

After the Chairman had welcomed the members Prof. Joh. Hjort distributed a letter of Nov. 11th 1938 from the Norwegian Foreign Office to the effect that Norway will not resist international efforts in this matter subject to certain reservations.

The available typewritten reports on the material collected and the work carried out by some of the members of the Sub-committee and some other scientists, a total of about 100 folio-pages with many tables and figures were studied and those recently

istributed discussed at the meeting. It was admitted, hat the Sub-committee was not prepared to give a nal report or a recommendation to the Consultative ommittee at the forthcoming Council meeting in erlin as it was found advisable to get some more formation of different kinds before finishing the ork.

The 2nd sitting took place the same day at 2 clock p.m. Discussion was continued as to what formation was still wanting. It was agreed that *ter alia* more information was wanted on the ine-fishing at Iceland, especially in Faxa Bay; he composition of catches from different fishing ears in Faxa Bay, according to species; recent bservations from patrol vessels; Icelandic fishery atistics; statistics of Halibut fishery in Brede Bay c.; continued marking experiments were considered esirable.

Moreover it was discussed that it would be advisable o give a brief summary on the work so far carried ut and the results obtained, and thus preparing the final report to the Consultative Committee submitted probably at the Council meeting in 1940. The main lines of such a progress report were considered.

The 3rd and 4th sitting took place on Saturday 18th at 10 o'clock a.m. and 2 p.m. The members prepared a short draft report of progress for distribution to all members of the Sub-committee; in this progress report were included various facts and results arrived at by the study of the material available; moreover some preliminary conclusions arrived at by various of the investigations were considered. The essentials of the scientific base on which any final proposal must be judged were included in the report. Moreover a communication to the Bureau which met on March 20th was prepared according to a wish from Prof. HJORT.

The 5th and 6th sitting of the Sub-committee took place Monday the 20th at 10 o'clock a.m. and 3 p.m. The preparation of the progress report was continued, and the final draft was revised. The meeting was closed by the Chairman at 5 o'clock.

PLATEAU CONTINENTAL ATLANTIQUE ET COMITÉ ATLANTIQUE

1938.

Par

Ed. le Danois.

A. Plateau Continental Atlantique.

Les Gouvernements intéressés aux recherches du Comité du Plateau Continental Atlantique ont effectué, dans le courant de l'année 1938, les croisières et investigations suivantes:

I. Recherches sur la Biologie du Maquereau.

En exécution des décisions prises par le Sous-Comité d'études de la biologie du maquereau qui s'était réuni à Plymouth les 8 et 9 Décembre 1937, les Gouvernements de France, de Grande Bretagne et d'Eyre, ont organisé du 20 Mars au 10 Avril 1938 des croisières simultanées pour déterminer les conditions physico-chimiques du Secteur du Plateau Continental placé au sud-ouest des Iles Britanniques et couramment désigné sous le nom de Mer Celtique. Les navires "Quentin Roosevelt" de la Marine Française, "George Bligh" du Service des Pêcheries d'Angleterre et "Muirchu" du Service des Pêcheries d'Eyre ont, en effet, réalisé ces croisières combinées en recueillant dans de nombreuses stations un matériel hydrologique et en effectuant des prises de plancton ayant particulièrement pour but de déterminer la présence des œufs pélagiques du maquereau.

Les résultats détaillés de cet ensemble de croisières paraîtront dans le prochain Rapport Atlantique.

II. Autres Recherches.

Espagne. Par suite des évènements politiques, le Gouvernement espagnol n'a pu effectuer de recherches dans le secteur du Comité.

France. Les résultats scientifiques des croisières du navire "Président Théodore Tissier" et notamment l'étude du matériel recueilli lors de la croisière de 1936 sur la côte occidentale d'Afrique, ont fait l'objet de plusieurs mémoires publiés dans la Revue des Travaux de l'Office des Pêches Maritimes. Ces mémoires sont dûs à MM. G. Belloc, J. Cadenat, P. Desbrosses.

De plus, M. J. Furnestin a publié une étude sur l'influence de la salinité sur la répartition du genre Sagitta dans l'Atlantique nord-est.

Grande-Bretagne. Le Service des Pêcheries d'Angleterre a fait procéder, en particulier par M. Hickling, à diverses études sur le merlu, la sardine et le maquereau.

Le travail sur le merlu a porté sur des mensurations: 62,600 merlus ont été mesurés en mer et presque 200,000 merlus sur les marchés de Fleetwood et de Milford. Les prises effectuées par les navires anglais employant la méthode espagnole dite "Pareja" ont fait l'objet de relevés spéciaux afin de permettre une comparaison entre les différents engins de pêche. Des prévisions sur le stock de merlus publiées dans la presse se sont vérifiées par la suite.

En ce qui concerne les études sur la sardine, le navire "Onaway" a travaillé en Septembre 1938 dans la pêcherie de sardine de Maunts-Bay avec recherches sur l'influence du maillage dans la capture des sardines. Des investigations comparatives ont déterminé les différences apparentes entre la courbe de croissance des sardines de Cornouailles et des sardines de Bretagne française.

A la suite de la croisière du "George Bligh" pour l'étude du maquereau, des analyses ont permis les déterminations des phosphates dans les eaux recueillies au cours de cette croisière. De même la distribution des œufs et des larves de maquereau a permis de préciser deux secteurs de ponte.

Eyre. Le navire "Muirchu", en plus de sa croisière de Mars—Avril effectuée pour l'étude du maquereau, a opéré une sortie le 19 et le 20 Août sur la côte nord d'Eyre.

De plus, de nombreux échantillons de harengs ont été étudiés du point de vue de l'âge, de la taille et de la maturité sexuelle dans la différence entre deux pêches de l'Ile.

Portugal. Par suite de réparations, le navire "Albacora" n'a pu effectuer de croisière en 1938.

B. Comité Atlantique.

Le Conseil International des Pêcheries de l'Amérique du Nord a tenu sa réunion annuelle à Boston le 4 et le 5 Octobre 1938.

Les études du Comité ont porté sur l'églefin, la morue, le hareng, le maquereau et le saumon ainsi que sur le homard. Des études hydrologiques ont été effectuées à la fois par les navires du Canada et des États-Unis.

La composition du Bureau du Conseil a été modifiée par suite de la démission du Président, le Dr. H. B. Bigelow, qui a été remplacé dans ses fonctions par le Dr. A. G. Huntsman; ce dernier a été remplacé comme Secrétaire Général par M. Higgins.

COMBINED NORTH SEA AND EASTERN CHANNEL COMMITTEE

1938.

By

G. Gilson.

The scientific survey of the intermediate region between the English Channel and the North Sea as entrusted to a special committee, in consideration f the intricacy and variability of the hydrographical nd biological conditions exhibited in the contact one of two very different sets of water joined by he narrow passage of Dover Straits.

It is a most interesting region for the study of orrelations in the fields of hydrography, meteoro-gy and biology, but the causes of error which oppose he efforts of the pioneer intent on the detection of elations between phenomena of various orders are nanifold and difficult to deal with.

In spite of obstacles, however, many facts and nuch material have been collected and made use of o a certain degree in the search for possible con-exions of hydrographical and meteorological influ-nces with certain biological phenomena such as the evelopment or disappearance of plankton, migra-on of fishes, growth and displacement of year-classes, ormation of feeding or spawning shoals, variations n the yield of fishery, etc. But it is still to be deplored hat enormous masses of well-tabulated figures, and f naterial well preserved in formalin, are held close or the benefit of the historians of biology in future enturies) in the archives and laboratories of the entres of research that are exploring the sea, con-nuously or occasionally, between the coast of Eng-and and those of France, Belgium, Holland and ermany.

Fortunately, it is expected that the establishment f the proposed *Annales Biologiques* may have a avourable effect in making these data more accessible, nd also that it will give a new impulse, not only to the synthetic work needed by an entirely new kind of scientific publication, but also to the co-operative search for decisive facts through the adoption of more modern ordering of marine investigation.

In conformity with the views of President Hjort, the general scheme of a regional investigation must, of necessity, include periodical series of simultaneous observations on certain fixed lines, and the *Annales Biologiques* should contain charts, diagrams and sections, in order to add visual impressions to the mere computation of figures in tables (see as example, the appended chart and figure).

Meanwhile, it remains scarcely possible to extract out of generally unfinished reports the exact extent of the work performed at various centres of research within the vaguely determined limits of the intermediate region[1]).

Biology.

Herring. The southern populations have been investigated, as usual, by the laboratories interested in the region, in France (Boulogne), England (Lowestoft), Belgium (Ostende), Holland (Helder), and Germany (Helgoland). A peculiar feature of the last herring season is that the youngest class, that of 3 years, born in 1935, appears in all records with a very low percentage; in fact it is the lowest observed in the course of the last ten years, except the very bad class of 1930, recorded in 1933.

The class of four-year-old herrings, on the contrary,

[1]) For details of each particular investigation see below the report of the Southern North Sea Committee and Appendices 14—16, this volume, part III.

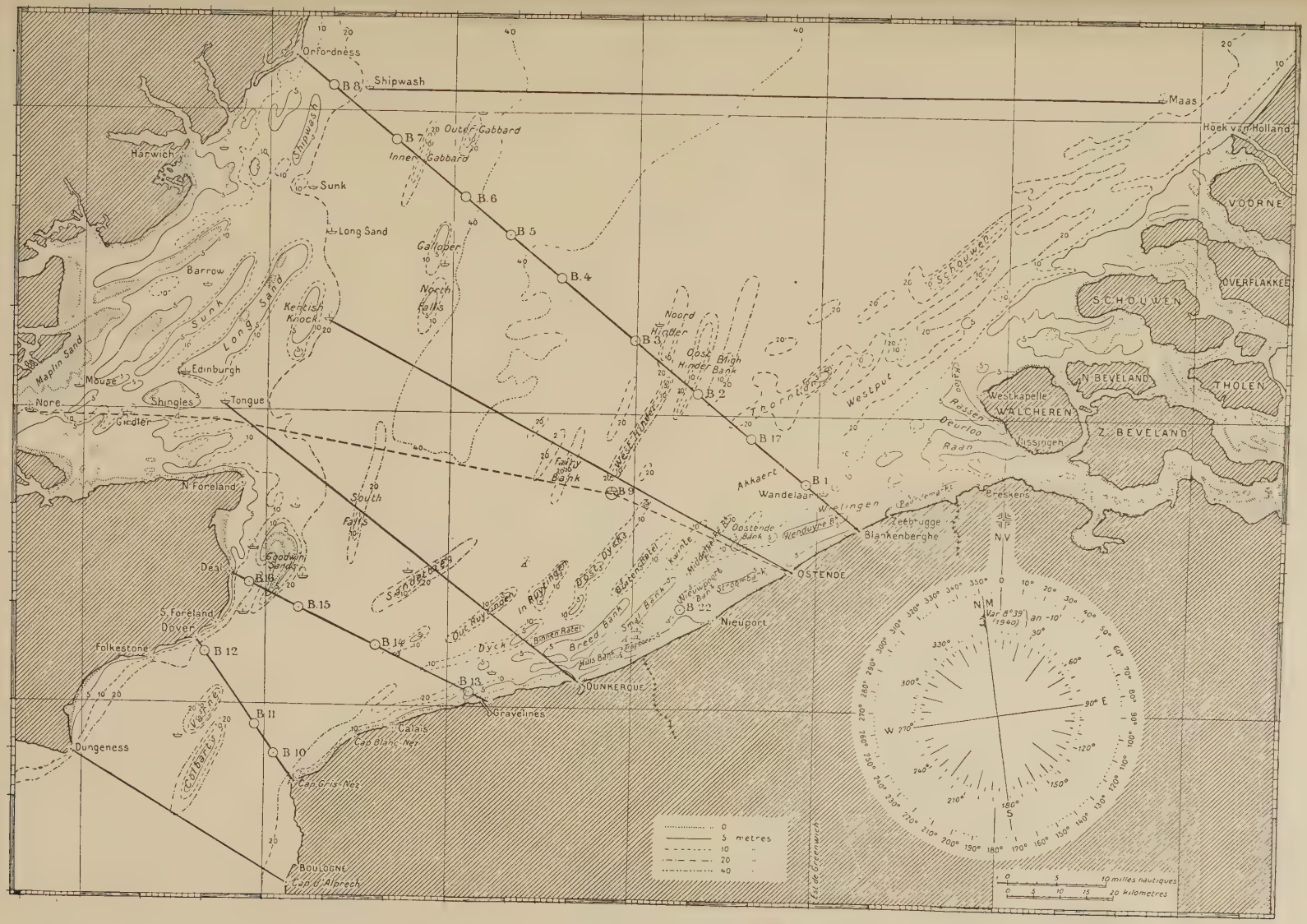

Fig. 1. Example of charts for plotting observations made during voyages.

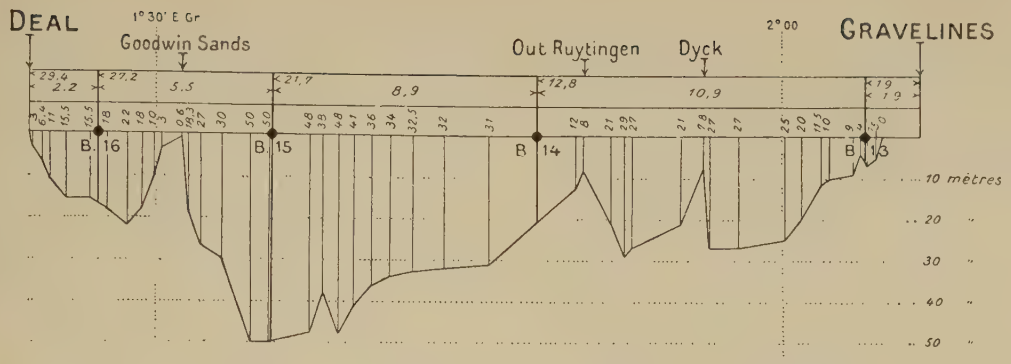

Fig. 2. Example of empty sections for use in the course of observations.

recorded with a very high percentage in the intermediate region and also from the north.

The results of the work carried out in the region each of the countries will be found included in me of the reports of the Council or in other publications. It is, however, desirable that some day the lk of the data collected be concentrated and made of for the drawing up of a general statement on composition and condition of the herring populans in the region and so establish a starting point a continuous investigation of their displacements d variation in the future. In view of that, it is ore than ever to be recommended that the greatest ssible accuracy be required in recording localities d times, especially when use is made of fishermen's tches.

Sprat. This fish is very abundant this season along continental coast and of good quality. It is mened (from Belgium) that the percentage of young rrings of the 0—I-group is very high. This constant sociation of herring with sprats is an interesting ture for the study of the biology of both fishes.

Pleuronectids.—Plaice. General work with research ps and on markets. Measurements. Distribution l frequency of age-classes. Growth.

Age and Size. On the suggestion of President ORT, an extensive investigation has been underken on the relation between size and age of the fishes in the southern part of the North Sea. Work s been started in all five countries bordering the uthern North Sea; England has supplied data from evious years, France and Belgium working in coeration[1]).

Fish eggs and larvae. Material collected from lightships "Varne", "Sandettié", "Galloper", Vest-Hinder", "Noord-Hinder", "Maas". Eggs and peid larvae picked out of surface plankton samples ken from research ships; bottom samples on the e Deal—Gravelines with a special net by the Beln survey ship "Zinnia".

Special investigation on sardine eggs in the eastern English Channel and of *Ammodytes* in the Southern North Sea by J. LE GALL.

Plankton.

The existence of a determining correlation between plankton development and variations in the milieu is evident and undeniable in many cases. There remains however, a great deal to learn about the circumstances and mechanism of the action of external causes producing the sudden occurrence of shoals and their subsequent extinction. Moreover, internal causes may arise also in the organism of all species of phyto- as well as of zooplankton. On the other hand, planktonic peculiarities appearing in the sea may reveal to the hydrographer the interference of certain physical or chemical factors claiming special attention and analysis. Consequently, all collection of plankton samples should always be supplemented by hydrographical and meteorological observations. In fact, hydrographical observations are generally made in connexion with plankton work, as was done on all research ships mentioned above having visited the intermediate region in the course of the year. On lightships, samples of plankton are generally taken only in the surface water. On some of them, "Varne", "Sandettié", "West-Hinder", "Haaks", samples of plankton and of water are taken from the bottom also. This is also the case in the "Zinnia" at all stations of the cross-section Deal—Gravelines and at all stations occupied during the cruises.

Hydrography.

Various research ships have traversed the intermediate region in the course of their cruises and made hydrographical as well as biological observations: "George Bligh" and "Onaway", of England, "Président Théodore Tissier", "Ailette", and "Quentin Roosevelt", of France; "Nautilus", of Holland; "Makrele", of Germany; "Zinnia", of Belgium. The several lines of steamers running between the Continent and the English coast have also contributed useful observations: surface temperatures, samples of water for salinity, liberation of drift-bottles.

[1]) See: G. GILSON, Preliminary Observations on Variations of Relation between Age and Size of Pleuronectids in the Southern North Sea. This volume, part III, App. 14.

The most important data, however, are those collected by the lightships anchored within the limits of the region: "Varne", "Sandettié", "Galloper", "West-Hinder", "Noord-Hinder", "Maas", "Haaks". Besides routine work, these carry out special observations with new registering instruments; drift indicator, Carruthers' vertical log, Hardy's plankton indicator. Some other lightships further north, must also be included in the great circuit of observation posts contemplated in the future. To this system, however, must of necessity be added certain fixed lines running across the general direction of the tidal or residual currents, and periodically visited by research ships doing simultaneous observations. One of these lines, crossing the Straits from Gravelines to Deal, is already made monthly by the "Zinnia".

The principal want in the hydrographical and biological exploration of the southern part of the North Sea is that of a central organization for collecting data and material from all sources and the timely publication of synthetic statement, with charts and sections, of the hydrographical and biological condition of the North Sea. The fishing industry is greatly interested in the scheme.

NORTHERN NORTH SEA COMMITTEE

1938.

By

Robert S. Clark.

Introduction.
I. Work at Sea.
II. Hydrography.
III. Plankton.
IV. Fisheries (a) Ichthyometrics.
V. Fish (a) Herring.
(b) Haddock.
(c) Plaice.
(d) Lemon Sole.
(e) Mackerel.
VI. Shellfish (a) Lobsters.
VII. Bottom Fauna.
VIII. List of Papers issued during the year on work carried out within the area.

INTRODUCTION

The programmes of work at sea within the area by the various research and protection vessels as proposed at last year's meeting of the Committee were carried out except in the case of the "Skagerak" which unfortunately was unable to implement the proposals, and the more important results of the investigations are incorporated in the following pages. Further progress was made in the study of the more important food fishes. The present positions of the various stocks have been defined largely from age analyses and predictions made as to future yield. Mortality rates in the stocks have been receiving closer attention and strenuous attempts are being made to define the optimum catch.

The present position of the **haddock** stock is not very illuminating. The commercial catches in 1938 were maintained largely by the prolific brood of 1935. This brood, now four years of age, will most likely dwindle rapidly after another spawning concentration in the spring of 1939. It was preceded by three consecutive years of poor recruitment and apparently has been followed by three other equally unsuccessful broods, so that the immediate prospects of the commercial catches being maintained at the same level as in 1938 are far from promising. A repetition of the poverty in catches experienced in 1935—1936 seems inevitable.

The year 1935 was also singularly fruitful as regards production and survival of **herring** broods. Three-year-old herring were abundant in the Forth, Clyde and west coast shoals and as more individuals from this year-class will almost certainly join the spawning shoals in 1939, better prospects for the spring fisheries are expected. The outstanding features of the summer-autumn fisheries were (1) the predominance of three-ringers (i. e. year-class autumn 1934) in the shoals off the north-east of Scotland, (2) the great scarcity of larger adult autumn spawners throughout the east Scottish coast and (3) an unusual immigration of spring spawning herring into Shetland waters in August month. The 1928 year-class predominated in the autumn spawning shoals for the seventh year in succession, but samples of spent herring from the

den ground in October and November indicated t a considerable number of three-ringers had also wned. The prospects, therefore, for 1939 are fairly d though the quality as denoted by size may be r.

he small **plaice** populations on inshore grounds the east Scottish coast during 1938 showed qual and poor recruitment generally since the last d survival year-class of 1935. Considerable stock letion was evident in areas open to seine net ing which was traceable also to poor recruitment. ransplantation experiment of mature and maturing from the Firth of Forth to the Norfolk coast ulted in just over 50 per cent. of the fish being aptured within a year of liberation, which is a d indication of the present effect of the intensity fishing on the adult plaice stocks. The recovery eight fish in Scottish waters indicates that some erchange may take place between Scottish and glish stocks.

Age and growth determinations of **Lemon Soles** e widened our knowledge of the biology of this portant species. Areas of distinctive growth-rate e been defined and progress has been made in essing the strengths of the annual recruitment to stock and the rate of elimination of the various r-classes.

n regard to the **cognate researches** on the surnding medium, the year under review showed a tial return to normal conditions. A strong influx Atlantic water took place in the early months of year and this was followed by weaker impulses summer and autumn. The Baltic effluent did not ead far westward over the North Sea, while an ension southwards of the Norwegian Sea circulation ards the northern part of the area was not in lence.

hese hydrographic conditions were reflected in distribution and abundance of certain plankton anisms. Arctic species within the area were more ess negligible in quantity. In the spring months, re was clear evidence of an immigration of some gnitude of Atlantic species, but the larger exotics, os etc., which are usually carried into the Northern th Sea in the summer-autumn months were not ntiful and did not extend far southwards into the th Sea. The distribution of the various types of er masses was indicated by the more or less sharp of demarcation between typical Atlantic and th Sea species, the western longitudinal half of North Sea containing much richer plankton than eastern sector.

he distribution and densities of the various om living invertebrates secured by otter trawl ing the cruises of the research vessels are receiving ntion and methods are being explored for the er utilisation of this material. For example, four ies of Prawns (*Pandalus*) inhabit Scottish waters of these species the most widely distributed is *dalus montagui*. Apart from their commercial value, these forms are important food constituents of several fish species.

This synoptic review of the main results of the investigations carried out within the area during 1938 was prepared from the reports rendered by the various members of the Committee and by the scientific staff of the Fishery Board for Scotland.

I. WORK AT SEA

Denmark.

During late April and the first few days of May, several stations were occupied by the "Dana" in the central part of the Northern North Sea. Trawling, bottom sampling and other ordinary routine work was carried out. In the Faroe—Shetland Channel two lines of stations were operated in May and August.

France.

The fishery protection vessel "Ailette" carried out cruises during the period May to September from the English Channel, North Sea and Iceland stations in connexion with the fisheries of the North Sea and the Murman coast.

Germany.

Two cruises on fishery protection vessels were made in the Northern North Sea to obtain material for the biological investigation of the herring.

Norway.

Two hydrographic traverses were made in the Northern North Sea in May (1) from Feie to Balta Sound and (2) from Orkney to Jaederen (near Stavanger) with a connecting line of stations between Shetland and Orkney.

Scotland.

Nine cruises were carried out by the "Explorer" during the period March to December. One of these, in June month, was almost entirely hydrographic and formed part of a joint survey of Gulf Stream waters, the area examined stretching from Skerryvore across Rockall Bank to longitude 18° W. and thence northwards to 63° N. within 30 miles of the south coast of Iceland. All the other cruises were devoted to general hydrographic and plankton surveys and to the analyses by trawl of the fish stocks, special attention being given to haddock, whiting and lemon soles. Examination of representative samples during the course of the fisheries formed the basis of the herring work.

The March cruise across the northern gateway between Shetland and Norway confirmed the deduction made in February from a spate of drift-bottle recoveries that a strong influx of Atlantic water was then in operation. The work in the Central North Sea during April and May was largely for the purpose of fixing the strength of the recruitment to the had-

dock stock by the brood of 1937. The cruises during the latter part of the year within the western sector of the North Sea as far south as the Dogger Bank were devised to give indications of the strength of the new recruitment to the haddock stock and to determine the prevailing hydrographic and planktonic conditions. The sections across the Faroe—Shetland Channel (1) Butt of Lewis to Faroe Bank—Syderö and (2) Nolsö—Flugga, as well as the circuit of the Faroes, were examined in July, while in August the areas within the plateau west of the Orkney—Shetland line and southwards along the west coast to latitude 56° N. (Stanton Bank) were also surveyed.

The motor research vessel "Kathleen" operated trawl and seine within the territorial waters of the east, north and north-west coasts from March to December, and carried out concurrently general hydrographic and planktonic investigations. The main object of these inshore surveys was the analysis of the small plaice populations.

Sweden.

The research vessel "Skagerak" having been in dock for repairs, the ling investigations planned for July in the Shetland and Hebrides areas had to be abandoned. The December cruise into the South-Eastern North Sea in search of herring larvae had also to be given up.

II. HYDROGRAPHY

Denmark.

Observations were made by the "Dana" at several stations in the Northern North Sea. In May, a line of stations between Flugga and Nolsö was occupied, while at the beginning of August a few stations on a more south-westerly course in the Faroe—Shetland Channel were investigated.

France.

Surface and bottom temperatures and water samples were taken during the cruises of the patrol vessel "Ailette". Sections were worked on the courses traversed.

Norway.

In 1935 a series of oceanographical observations was instituted during April and May in the Northern North Sea, comprising a number of cross sections between western Norway and the Orkneys and Shetlands along four lines, the sections being a few miles south of each of the parallels 58, 59, 60 and 61, and the stations being spaced five or ten miles apart according to the depth contours.

In 1937 this programme was extended by the addition of three further sections running approximately perpendicular to the coast through the area immediately to the north so as to give a complete picture of the oceanographical conditions in the Northern North Sea and the area bordering on the rest of southern Norway.

In 1938 the full execution of this programme was unfortunately much curtailed by very stormy weather, so that only two of the sections could be worked, namely, (1) from Feie to Balta Sound and (2) from Orkney to Jaederen (near Stavanger), with a connecting line of stations from Shetland to Orkney. Altogether fifty-six stations were occupied between the 10th and 20th of May and 436 observations made on temperatures and salinities.

The weekly thermograph service from Bergen (Stavanger) to Newcastle on the liner "Jupiter" and the fortnightly service from Bergen to the Faroes and Reykjavik on the liner "Lyra" were maintained throughout the year.

Scotland.

The chief hydrographic features of the Northern North Sea during 1938 were the strong influx of Atlantic water at the outset of the year, and the weaker impulses in summer and in autumn. Arctic water was not much in evidence, if at all, and the surface Baltic effluent did not extend far westwards over the northern area. During the latter part of the year, the drift-bottle results indicated a northerly drift along the western margin of the Northern North Sea. Conditions, therefore, within the area appear to have become more or less normal, after a long-period cycle of abnormalities. Fuller details will be found in the report of the Hydrographic Committee.

III. PLANKTON

Denmark.

Samples were collected at various stations at the beginning of May.

France.

Material was collected during the course of the cruises of the fishery patrol vessel "Ailette". The distribution of the various species of Sagitta was investigated and the results published. Mackerel eggs and larvae were extracted from the collections for special study.

Scotland.

The nets in use were the Standard Fine Silk Hensen, and 2-metre Cheesecloth for vertical hauls and the one-metre cheesecloth for horizontal hauls. The continuous plankton recorder was again in operation on fixed shipping routes, the material being dealt with separately at the Leith Laboratory.

Phytoplankton. The standard net collections are gradually being overhauled and a report will be published at a later date. During March and April a great variety of diatom species normally regular constituents of North Sea plankton was encountered in the area east of the Shetlands and off the Moray Firth, but along latitude 61° N. several rare species of Atlantic origin were observed. At the end of April and in May, patches of Phaeocystis occurred south

he Shetlands and east of Fair Isle, east of the neys, in the vicinity of Ling Bank and at the h end of the Gut. *Chaetoceros decipiens* was very ndant at the Shetlands and east of the Orkneys. *zosolenia semispinis* and *R. styliformis* were abun- t over the greater part of the northern area.

ooplankton. The Hensen net collections brought clearly the great preponderance in each month he immature stages of Calanus and the extra- nary abundance of the smaller copepods, ecially Pseudocalanus. This feature of the plankton have significance in regard to growth and/or vival of larval fish. The coarser nets showed a t general scarcity of adult Calanus so that the onderance of young stages was all the more rising as well as being most unusual. Acartia, tropages, Temora and Microcalanus were notice- more abundant than usual. A paper on the iency of the Hensen net has been prepared for ulation at the next meeting of the Committee.[1]) he general macroplankton conditions were as ows.

arch: A fairly rich plankton occurred within just outside the Forth estuary. Off the Moray h the collections were extremely poor. Decapod ae were abundant at Fair Isle. Between Flugga Viking Bank, the presence of *Sagitta serrato- ata*, Rhincalanus and Physophora indicated a y strong penetration of Atlantic water.

pril: Oceanic forms were abundant in the hern area. *S. serratodentata* extended south to tude 58°30′ N. and as far east as the Gut. Calanus scarce—an isolated dense patch being observed in Cullen Deep. Larval herring of the smallest s were taken north-west, north and east of the tlands, occurring in great abundance immediately h-west of Viking Bank. Except for a few *Sagitta uns arctica* immediately north of Viking Bank, arctic species were observed in the collections.

tongue of rich plankton was observed close to East Scottish coast, including Calanus, *S. elegans*, apod larvae etc. Further east, the plankton me much poorer and *S. setosa* dominated the hes.

ay: The same tongue of rich plankton was found g the east Scottish coast. Calanus was fairly ndant at the Long Forties. Between Ling Bank the Naze, a mixed plankton contained *S. setosa*, rratodentata, *Calanus hyperboreus*, *Oikopleura adoriensis* and herring larvae. On the Great er and Dogger Banks, no herring larvae were ined but the plankton consisted of an abundance *. setosa*, Aglantha, Obelia and *Schistomysis ornata*. he Moray Firth and Fair Isle regions were much er in plankton content. Along the east side of land, to the west of the stream current, i. e., of the prime meridian, an extremely rich kton was observed which included Calanus, Thy- essa, Decapod larvae, Limacina, *S. elegans* and *serratodentata*, Tornaria larvae, Arachnactis, Rhincalanus and herring larvae.

June: Off the Butt of Lewis, a Phyllosoma larva of Palinurus was taken, along with Fierasfer larvae and several Doliolids (*D. gegenbauri*). In the region just south of the Wyville Thomson Ridge, Themisto was extremely abundant at the surface, while in the sub-surface strata *Salpa zonaria* and the Cephalopod Tracheloteuthis were found.

July: The smaller plankton forms were more abundant than the larger. *Sagitta maxima* and *S. lyra*, Eukrohnia, *Salpa zonaria*, Galeolaria, Tracheloteuthis occurred but were far from numerous. Calanus occurred in abundance only in the region east of Syderö.

August: *Salpa fusiformis* was taken off the west coast of Scotland. Calanus was scarce except in the Minch. Medusae, including *Aequorea forskalei*, Cosmetira, Mitrocomella, Turris, Sarsia etc. were generally common. Agalmopsis was also taken. Larval lobsters appeared in the collections off the Hebrides.

September: The entering stream current lay between the prime meridian and longitude 1° E. where Salps and Doliolids, *Sagitta maxima* and *S. lyra* and Agalmopsis were obtained. The demarcation of the western and eastern longitudinal sectors of the North Sea was again in evidence, the former containing a rich and the latter showing poor plankton content. Herring larvae of autumn origin were taken within the western sector and also at Flugga where newly hatched stages were secured.

October: Similar conditions to those for September were observed in the Middle North Sea region. Herring larvae occurred within the Forth estuary.

November—December: The north coast of Scotland, the Moray Firth and Firth of Forth showed a great similarity in plankton content. *Sagitta elegans*, Thysanoessa, Aglantha and herring larvae etc. were abundant. *S. serratodentata* occurred occasionally, while adult Calanus were scarce. This similarity is of interest in view of the observed northerly drift of the surface waters along the Scottish east coast during the last quarter of the year.

A paper on the distribution of Sagittae during 1937 will appear in the April issue of the *Journal du Conseil* (Vol. XIV, p. 25).

IV. FISHERIES

(a) Ichthyometrics.

Denmark.

All the constituents of the trawl hauls, including haddock, lemon soles, witch, cod, whiting etc. were measured and scales and/or otoliths retained for age-determination. The numbers of haddock taken by the 50′ otter trawl were extremely poor, averaging only eleven fish per one hour's trawling. The results, however, were slightly better in the northern part of the area than in the region of the Dogger Bank. The material was handed over to Scotland for utilisation in the general haddock investigations.

[1]) Gibbons, S. G. "The Hensen Net." Journ. du Con- XIV, 2, 1939.

England.

Measurements were taken at sea of the following fish:— 427 Plaice, 12,182 Cod, 819 Whiting and 26,506 Haddock. The haddock data were sorted into length frequency distributions and forwarded to Scotland for analysis.

France.

Measurements were carried out on herring and mackerel caught on the Fladen, Fisher, Viking and Utsire grounds.

Germany.

The course of the herring fishery was followed as in previous years from market samples. At the close of the fishing season statistics were compiled and the results published in a statistical review. In the herring drift-net fishery, day-books to show the catches of the drifters were again issued. It was not intended, however, to work up these day-book records as in previous years, namely, to publish monthly and yearly charts of the course of the herring fishing, as it has been found that the practical fishermen could not make adequate use of the estimations and statements so far issued. A beginning, however, has been made in compiling the data so as to obtain a trustworthy review of the course of the drift-net fishing over a considerable period. Special attention will be directed to the point whether observed regularities or deviations arise from definite factors.

The special statistical enquiries regarding the fishing grounds and the intensity of fishing per fishing day by the German steam fishing vessels were continued. In addition to the usual market measurements, about 22,300 fish, the so-called unmarketable sizes from the North Sea were measured. To a considerable extent, these market measurements contributed to the identification of the unmarketable sizes caught by the fishing vessels as the young of food fishes landed for the manufacture of fish meal. It was shown that in the catch of saithe in the most northerly part of the North Sea, the unmarketable part with unimportant exceptions consisted of *Gadus poutassou*, large numbers of which were landed for fish meal manufacture.

Table of Market Measurements at Wesermünde.

	Cod	Haddock	Saithe	Sebastes	Other Marketable Species	Unmarketable	Total
Numbers.....	31	2,918	1,020	411	1,386	22,289	28,055
Weight (Kg.).....	150	914	4,078	400	397	1,846	7,885
Samples examined ..	1	15	6	4	9	47	82

Holland.

Measurements and scales of haddock from market samples at Ymuiden were forwarded to Scotland for treatment.

Scotland.

Measurement of samples of lobster catches at selected localities round the Scottish coasts were continued.

Observations were again made on the commercial seine net landings of plaice from Aberdeen Bay. Samples of the various size categories were measured regularly throughout the year. There was an obvious decline in the catches which was largely due to the relatively poor recruitment from the last two year-classes.

V. FISH.

(a) Herring.

France.

The usual observations on the Fladen herring were continued.

Germany.

In addition to the investigations on the whole of the herring fishing in the North Sea, special investigations of a biological nature were carried out on the herring of the Northern North Sea. For this purpose, two cruises on fishery protection vessels were made in the Northern North Sea to obtain the requisite material which was supplemented from market samples. The investigations included the determination of length, sex, maturity, age and number of vertebrae, the main object being to establish the different components in the herring shoals of the Northern North Sea. Special importance was attached to the determination of maturities. To secure accuracy in the work, the length, weight and volume of the gonads, as well as the diameter of the ova, were determined. In addition, special attention was given to the examination of the statoliths. In conjunction with the Scottish work on the herring, Dr. ERDMANN visited Aberdeen and collaborated with the Scottish investigators at the Laboratory of the Fishery Board for Scotland. The results have been published in two papers, *vide* Literature List.

Scotland.

The herring investigations were continued on the same lines as in previous years, representative samples being examined during the course of the various fisheries. About 15,000 herring comprising samples from Shetland, Clyde and Forth, west coast of Scotland (Barra and Stornoway), Viking Bank, Fladen and the grounds between Shetland and Peterhead were examined during the year. In addition to

utine observations and the collection of scales, unts were made of the vertebrae and keeled scales each individual herring. A summary of the results these investigations will be found in the 57th nual Report of the Fishery Board for Scotland. With the object of determining the growth rates the various herring communities established in ottish waters, a large number of growth calculations s been made from the scale rings. This work is ogressing and some interesting and important ults have already been obtained, which confirm the dings from the racial investigations.

(b) Haddock.

otland.

The present position of the haddock stock and ediction as to future yield are outlined in the entific chapter of the 57th Annual Report of the shery Board for Scotland. During 1938, the year-ss 1935 formed the mainstay of the haddock ches in the North Sea and adjacent waters. It s preceded by three successive years of poor ruitment, namely 1932, 1933 and 1934, and it ms to have been followed by three equally unsuc-ssful broods, though it is yet too early to assess finitely the strength of recruitment by the 1938 ar-class. According to the data from the research ssel the growth rate of the 1935 brood has been ove the average. At the end of 1938, its average gth in the North-Western Area was fourteen inches, e average figure for North Sea haddock at the end the fourth year of life being usually slightly less an $13^1/_2$ inches.

The initial strength of the 1936 brood was similar that of 1934 and was therefore definitely of inferior ler. The densest concentration was in the Central rth Sea within the region of slowest growth rate. e 1937 brood was even less numerous and had a ilar concentration. So far as observations from e research vessel have gone, the brood hatched in 38 gives no indication of survival having been on iberal scale.

The 1935 year-class has now been subjected to nsiderable attrition and though it persisted in the ches during 1938 in greater numbers than might ve been expected even from a prolific brood, its mmercial importance will henceforth dwindle idly after another spawning concentration in 39. With the fishing out of this brood, another porary period of stock depletion and considerably aller catches, as experienced in 1935—36, is ev-table.

(c) Plaice.

otland.

Analyses of the small plaice population within the ritorial waters of the east and north coasts of otland were continued. The standard sampling paratus was an otter trawl with a 30 ft. headline d a small meshed cod-end to give total representation of the age-groups present on the grounds. Considerable variations in annual recruitment on the various sections of the coast were again in evidence. The last good survival brood to be generally distributed was the year-class 1935. Since that time, three broods have been added to the stock and these have been unequal in distribution, and relatively poor to moderate in abundance. The 1936 and 1937 broods were fairly well represented in Aberdeen Bay and the Moray Firth, while the 1938 brood, so far as observations have gone, was moderately abundant only in the Firth of Forth region.

Marking experiments were carried out in an attempt to trace the relationship between the plaice stocks of the north and north-west coasts and those of the east coast of Scotland, but so far the recoveries have been too few to draw conclusions.

The recaptures at the end of 1938 of plaice from the Haisboro' liberations in October 1937 amounted to just over 50 per cent. Eight of the recaptures have so far been recorded from Scottish waters, thus indicating interchange to some extent between English and Scottish stocks.

(d) Lemon Soles.

Scotland.

Investigations on the general biology of this species were continued and a paper on age and growth rate has been published. There are areas of distinctive growth rate which are reflected in the quality of the commercial landings from the various localities. The marketable stocks cover a wide range in year-classes. Progress has been made in a general way in assessing the strengths of the recruitment by the various year-classes.

(e) Mackerel.

France.

Observations on the concentrations of mackerel on the Utsire, Fisher Bank and Fladen grounds were continued. The results obtained will form the subject of a subsequent publication.

The following is a résumé of the results:—

The North Sea stock of mackerel appears to be quite independent of the stock in the English Channel or on the western Continental plateau. The North Sea mackerel form a geographically independent population which has its own spawning grounds and feeding and breeding concentrations. The spawning of North Sea mackerel begins about the middle of April, reaches its maximum in May—June and continues to the end of August and even later. Mackerel at Stage VI (plum pudding stage) were observed north of the Fisher Bank at latitude 58°50′ N. on 15th October 1938.

This long spawning period explains the annual variations in growth which have hitherto been observed and interpreted in different ways.

The following annual increments have been recognised provisionally.

Total length
to the end of the first year of existence = 10 cm.
at the end of the second year of life = 20 -
- - — - - third — - - = 27 -
- - — - - fourth — - - = 30 -
- - — - - fifth — - - = 32—33 cm.

Sexual maturity occurs for the first time at the end of the fourth or the beginning of the fifth year of life. Some mackerel, however, may spawn at the end of the third (at less than 27 cm.) or at the beginning of the fourth (> 27 cm.) year.

VI. SHELLFISH

(a) Lobsters.

Scotland.

The lobsters transferred alive to the tanks at Millport Marine Station in June 1937 were kept under observation during 1938. Nineteen of these moulted once and two twice during the summer months. Ten of the moults occurred during the period 10th to 21st June when the average temperature-reading in the tanks was 13·3° C. The six females mated in 1937 all spawned but failed to retain their eggs for more than eight to ten weeks. None of these six gave any further evidence during 1938 on the sexual cycle which is known to show a biennial periodicity. Experiments on food and growth under different conditions as to temperature are being continued.

VII. BOTTOM FAUNA

Denmark.

Bottom sampling was carried out at all stations in the area during April—May, the Petersen 0·2 m.^{2} and the Van Veen bottom samplers being used.

France.

A paper has been published on the material collected by the "Président Théodore Tissier" during the course of dredging operations.

Scotland.

Observations on the food of plaice and on the bottom animals inhabiting inshore waters were continued during the year in Dornoch Firth, Aberdeen and St. Andrews Bays. Extensive populations of *Donax vittatus* were present within the four-fathom line in Dornoch Firth and St. Andrews Bay and contributed a large part of the food of adolescent plaice inhabiting these depths. In the deeper parts of Dornoch Firth the plaice feed chiefly on Amphiura and *Cultellus pellucidus*. *Nucula nitida* occurred in greater quantities than usual in St. Andrews Bay and was particularly prominent in the deeper muddy parts. This feature was reflected in the appearance of a larger proportion of this Mollusc in the stomachs of plaice than has been observed previously. Conditions within Aberdeen Bay showed no important changes from previous years. Nephthys, Arenicola and Sandeels continued to form the principal diet of plaice within a depth of four fathoms. In deeper water out to 20 fathoms Lanice and Nephthys were the principal food forms.

A study of the genus Pandalus was continued. *P. montagui* is the most widely distributed species, being found over the greater part of the North Sea and on grounds to the north and west of Scotland. *P. bonnieri* (*leptorhynchus*) also occurs over a wide area, but has not been recorded south of latitude 57° N. in the North Sea. Fair numbers of *P. borealis* occur on the Fladen grounds and in Farne Deeps but only occasional specimens of *P. propinquus* have so far been obtained.

A study is being made of the life history of *P. montagui*. There is evidence as in the Norwegian Prawn of protandrous hermaphroditism. Berried females occur between November and March and hatching is completed by April. Young specimens occur in August but are more plentiful in September when their average length is 4 to 4·5 cm. Most of these are males, the change over being effected at a slightly larger size.

VIII. List of Papers issued during the Year on Work carried out within the Area.

Erdmann, W. Der deutsche Schleppnetzheringsfang 1937. Der Fischmarkt. 1938, Heft 3.

— Ein Beitrag zur Rassenfrage beim Schottischen Frühjahrshering. Rapp. et Proc.-Verb., Vol. CVII, III. 7.

— Ein Beitrag zur Rassenfrage des Frühjahrsherings im Firth of Forth. Ber. der Deutschen Wiss. Komm. f. Meeresf., Bd. IX, Heft 2.

Fraser, J. H. The Distribution of Chaetognatha in Scottish Waters in 1937. Journ. du Conseil, Vol. XIV. No. 1, p. 25.

Gibbons, S. G. Early Development Stages of Copepoda. II. *Metridia lucens*. Boeck. Ann. Mag. Nat. Hist., Ser. II, Vol. II, Nov. 1938.

Furnestin, J. et Berthois, L. Etude des sédiments dragués par le "Président Théodore Tissier". Revue des Travaux de l'Office des Pêches, Tome XI, Fasc. 3, No. 43.

Ogilvie, H. S. The Food of Post-Larval Haddock with reference to the annual fluctuations in the Haddock Broods. Rapp. et Proc.-Verb., Vol. CVII, III. 11.

Rae, B. B. Lemon Sole Larvae in Scottish Waters during 1931. Rapp. et Proc.-Verb. Vol. CVII, III. 9.

— Age and Growth of Lemon Soles in Scottish Waters. Fisheries, Scotland, Sci. Invest., 1939, I.

— Marking Experiments on Lemon Soles at Faroe, 1923—1936. Journ. du Conseil, Vol. XIV, No. 1, p. 35.

Ritchie, A. Preliminary Observations on the Food of Plaice in Scottish Waters. Rapp. et Proc.-Verb., Vol. CVII, III. 10.

Schnakenbeck, W. Die Untersuchungen über den Hering und die Heringsfischerei. Ber. d. Deutschen Wiss. Komm. f. Meeresf., Bd. IX, Heft 2.

Chapter VIII, Scientific Investigations, 57th Annual Report, Fishery Board for Scotland for the year 1938.

SOUTHERN NORTH SEA COMMITTEE

1938.

By

A. Bückmann.

roduction.
Work at Sea.
Fish.
I. General.
1. Statistics and Ichthyometrics.
2. Experiments on the Fishing Capacities of Trawls.
3. Food of Fishes.
II. Cod and Haddock.
III. Herring.
1. Survey of Stocks and Landings.
2. Rate of Growth.
3. Young Herring.
4. Larval Herring.
5. Herring Races.
IV. Plaice.
1. Survey of Stocks and Landings.
2. Rate of Growth.
3. Marking and Transplantation Experiments.
4. Eggs and Larvae.
5. Racial Investigations.
V. Sole.
VI. Other Fish.
Shellfish.
Benthos and Deposits.
Plankton.
Hydrography.
pers published in 1937 relevant to the Work of the Committee.

INTRODUCTION

At the present moment the study of one question ms all important, What connexion exists between intensity of fishing to which a food-fish stock is jected, and the yield it produces? The answer to s question is of the greatest interest to us, as it very doubtful whether the food-fish stocks give best obtainable yield by the existing means and the present intensity of fishing (8). There is a nber of indications opposed to this conception, but should give indisputable proofs.

n order to make progress in this direction, it is essary to reach, by way of theoretical consider- ons, a correct knowledge of the complicated ations and thereby to formulate a clear statement the question. The results of such considerations so made have been reviewed during the year (1).

In addition, however, the work of collecting observations and material must proceed without interruption, to provide information on the factors determining the productivity of the stock. Probably growth is the most important of such factors. The discussions on growth conditions of food-fish at the Special Scientific Meeting in May, 1938, were thus of the greatest interest to our Committee, and thanks to the willing assistance of experts, copious reports were presented from the Southern North Sea area (2, 3, 19, 22).

During the year the work of the Committee was continued in other directions without noteworthy change. A new feature was the investigation of possible damage to the bottom fauna by intensive trawling. This question is of practical interest, as the bottom fauna is the source of nourishment for many important kinds of food-fishes. So far damage has only been proved to bottom organisms of minor value as food.

Plaice investigations, which form a specially important part of the Southern North Sea work, have received the valuable addition of Belgian and French work in the southern part of the Flemish Bight. The simultaneous trawling operations undertaken for comparison of gear by the three research vessels "Dana", "George Bligh" and "Makrele" took place near Helgoland in June, and will strengthen the efficiency of the international co-operation on plaice.

For the study of the causes of fluctuations it is considered important that their connexion with meteorological conditions was established in some additional cases.

The effect of meteorological factors is supposed to act indirectly through their influence on the water and the current. Hydrographical observations in our area being highly important, it is a great satisfaction to note that they have been made with increased intensity; the extension and continuation of light-vessel observations deserves special mention.

Reports on hydrographic and plankton work have been mentioned in this report only in reference to other work, but are otherwise to be found as part of the reports of the relevant Committee. The Belgian

work has had brief reference, as a full report is given by the Chairman of the Combined North Sea and Eastern Channel Committee.

The Committee wish to express their gratitude and appreciation of the valuable assistance given by owners, officers and crews of fishery patrol vessels, fishing vessels and light-vessels who have assisted the Committee during the year.

A. WORK AT SEA

Denmark.

The research vessel "Dana" carried out work in the area during late April, at the beginning of June and during August. Quantitative hauls with the 50-foot otter-trawl were taken in the Horns Reef area between 29th May and 3rd June at 8 stations and between 9th and 12th August at 21 stations, especially for the observation of the plaice stock.

From the S/S "Biologen" quantitative hauls with the eel-tog were taken in the Nissum broad on 17th June at 5 stations, and on 14th September at 6 stations.

Hauls with the Johansen young-plaice trawl were made from a motor-boat in the coastal region between Hanstholm and Tyborön on 20th—21st July.

In the waddensea area off Esbjerg a motor-boat was commissioned during the summer months. Work on fish eggs and larvae was carried out from the Horns Reef L/V. during the winter until 1st March. Current measurements with the "Vertical-log" also took place.

England.

The "George Bligh" was in continuous commission throughout the year. Seventeen voyages were carried out in the area. On six of these trawling was carried out, including tests of new gear, on the effect of trawling on the bottom fauna, and herring trawling. Four were for plaice eggs and the remainder dealt with plankton and hydrography.

The "Onaway" worked throughout the year on her usual programme of herring shoals, plankton, and hydrography.

France.

Routine observations have continued:—

1. "Sandettié" lightship. Daily observations of temperature and collections of water samples from surface and bottom; current measurements, in collaboration with the Fisheries Laboratory, Lowestoft.

2. Route Dunkerque—Folkestone.

3. Route Boulogne—Folkestone. Hydrological observations in collaboration with the Lowestoft Laboratory.

Cruises were made with the Fishery Protection vessel "Ailette" from the Naval Station of the Channel, the North Sea and Icelandic waters.

Germany.

The "Poseidon" was not available for work in the North Sea.

The M/S "Makrele" belonging to the "Biologische Anstalt" at Helgoland was commissioned from the 16th to 28th May for investigations into food-fish in general and plaice in particular within the German Bight. Simultaneous observations were made on fry and other macroplankton, on surface plankton and hydrography. — From May 31st to June 2nd the "Makrele" took part in the comparative trial-fishing from three research vessels.

Between the 22nd and 25th June the cruise was extented for intensive macroplankton observations off the North-Frisian coast. During summer and autumn fishing and plankton investigations were repeated round Helgoland.

As in previous years, a cruise was made with the Fishery Protection vessel "Elbe" from 25th November to 9th December to investigate fish fry, herring larvae in particular, surface plankton and hydrography. The work unfortunately suffered from the effect of bad weather. Members of the "Fischereibiologische Abteilung", Hamburg, took part in a cruise with a fishing vessel to the Dogger Bank between the 22nd and 31st October for the investigation of herring.

Scotland.

The "Explorer" carried out extensive surveys (trawling, hydrography and plankton) during April, May and October within the area bounded by 55° N., the line Berwick to the Naze, the English coast eastwards to longitude 5° E. All cruises were extensions of similar work in the southern region of the Northern North Sea. The main objects of the cruise were (1) to analyse the haddock, whiting and lemon sole stocks and (2) to define the hydrographic and plankton conditions within the central North Sea, with special reference to the water masses, to the extent and nature of phytoplankton patches, to the distribution and abundance of *Calanus*, *Sagitta* etc., and the frequencies of occurrence and dispersal of fish larvae, particularly haddock, herring and lemon soles.

B. FISH

I. General.

1. Statistics and Ichthyometrics.

Denmark.

All material of interest was measured and market measurements on plaice were carried out in Esbjerg.

England.

The collection of statistics and ichthyometrics has been continued, and the number of the chief species measured is approximately as follows:

At Sea.

Plaice	Haddock	Cod	Whiting	Total
726	26,506	8,546	1,380	37,158

On the Markets.

laice	Haddock	Cod	Herring	Total
5,762	3,044	33,292	112,042	195,140

The data for the haddock measured at sea were nalysed into length-frequency distributions and rwarded to the Fishery Board for Scotland.

rance.

Measurements of various food-fish were carried out before; the species specially studied were: herring, ackerel, sardine, sprat and plaice.

ermany.

The "Arbeitsstelle für Fischereiforschung" of the Biologische Anstalt" Helgoland, and the "Institut für efischerei", Wesermünde, have continued compiling atistics on fishing grounds and duration of voyages.

olland.

At Ijmuiden market some 7,000 plaice and more an 24,000 sole were measured (cf. B. IV. 1 and V.); measurements were undertaken with the ject of studying the effect of introducing the anned minimum-size regulations.

Experiments on the Fishing Capacities of Trawls.

enmark, England, Germany.

On 30th May the research vessels "Dana", "George igh", and "Makrele" met on the Helgoland roads carry out the comparative trawling experiments commended by the Council. Such experiments for mparing the catching power of the gear used by e various research vessels are very important for e effective co-operation in investigating the food-h stocks, in particular that of plaice. The experi-nt was carried out from 31st May to 2nd June tween Helgoland and the Amrum Bank L/V. In ite of bad weather it was possible to make 15 hauls ch of one hour duration and an extensive material measurements was collected; the lists of data have en sent to the Fisheries Laboratory at Lowestoft r further treatment.

ngland.

Further experiments were carried out with the er board substitute known as "Wollaston Craw-s".

ermany.

A report on comparative catches from the "Posei-n" and the "Makrele" during May 1937 has been blished (4).

3. Food of Fishes.

Germany.

A report by H. Hertling on the food of haddock, whiting, and cod in the Southern North Sea has been completed and published (21). Another report on the food of plaice and other flatfish in the East Frisian coastal waters is in preparation. Both reports consider the calorific value of food organisms by Rinke's heat-value methods.

II. Cod and Haddock.

Denmark.

The catches made by the "Dana" during the spring were very small, the 50-foot otter-trawl being used. The material of **haddock** has been handed over to the Aberdeen laboratory for inclusion in the work carried out by Scotland.

England.

Observations on the Grimsby market have been continued. The productivity of the stocks of **cod** appears to have improved, mainly owing to better survival of fish of small and medium size. If later figures show the same apparent improvement, the conclusion will be that the cod is being fished less wastefully than in the period 1930—36. This, however, cannot be concluded from a rise in the apparent survival in one year of observation only.

Scotland.

Measurements of the catches by the research vessel continue to be recorded, along with data on sex and food. Representative otoliths are also retained. During the April—May cruise, the numbers of **cod** caught were infinitesimal, while in October the catches were also very poor. Few large fish were taken, whilst the most frequent sizes ranged from 25 to 40 cm. A smaller group from 9—15 cm. was present in the small-mesh catches.

The brood forecast of **haddock** will appear in the Annual Report of the Fishery Board for Scotland, while a summary of the main results of the investigations for the year is included in the Report for the Northern North Sea. The sampling of the haddock stock in the central North Sea in April—May was done largely with a view to fixing the strength of the recruitment to the stock by the brood hatched in 1937. The observations confirmed the previous provisional estimate at the end of 1937, that this year-class was not of a successful nature. Accordingly, there have been two successive years of poor survival of haddock broods, namely, 1936 and 1937. The survey of southern waters in October of the year under review did not reveal any great numbers of baby haddock of the 1938 brood though all individuals of this brood would not then have taken to a permanent bottom habitat. During the spring survey, at the end of the spawning period, few older haddock, as expected, were encountered within this Southern

North Sea area, most of the prolific 1935 brood and all older fish having migrated northwards to deeper water for spawning purposes.

III. Herring.

1. Survey of Stocks and Landings.

Belgium.

The study of the coastal spent herring, uninterrupted since 1930, was continued. The 1933 year-class, appearing in the shoals for the first time, was found remarkably poor, contributing only 9·4 % to the stock.

Denmark.

Samples of herring caught by Danish cutters north-west of the Dogger during October were examined for size, age and race.

England.

The annual survey of the East Anglian herring fishery has again been completed and in the course of the work 112,042 fish were measured on the markets of Yarmouth and Lowestoft. At the laboratory 3,000 herrings were examined for age, length, weight, and l_1.

According to the fishery forecast issued in August a large supply of young fish was expected and the final calculations show that 79 % of the herrings landed belonged to the age-groups III, IV and V; 55·3 % of the total catch were four-year-old fish.

France.

The concentrations of herring in the Southern North Sea and the Eastern Channel were studied according to the usual programme.

The stock is characterized by the abundance of the year-class 1933, which was noted already in 1937 when this class appeared for the first time on the spawning grounds. The disappearance of older individuals was again distinctly apparent, a fact that cannot be explained by the relative density of the year-classes, but by increased fishing intensity only.

A report on the 1937 observations has been published (11).

Germany.

Herring investigations by the "Fischereibiologische Abteilung", Hamburg, were mostly made in the Northern North Sea and are therefore described in the report of that area. (See also under A.)

Holland.

Dutch herring investigations are reported upon in the report of the Combined North Sea and Eastern Channel Committee.

2. Rate of Growth.

England.

During the year an attempt has been made to find out the connexion (if any) between the herrings which are taken in the trawl to the north of the Dogger Bank and the drift-caught fish of East Anglia, and in this connexion the length l_1 has been calculated for many hundreds of fish.

France.

The investigations on the successive value of l_1, l_2, l_3 etc. in the various groups of the Southern North Sea and the Eastern Channel were continued.

3. Young Herring.

Denmark.

Collections of young herring were taken in the Waddensea area in August.

England.

The routine collections of young herring have again been made on the Northumberland coast.

		Size.									
Length in cm.		20	21	22	23	24	25	26	27	28	29
Group Dyck-Sandettié	%	1·2	4·3	8·0	20·4	20·1	16·8	19·0	8·0	1·7	0·4
— I north of the Somme	%	—	0·6	6·6	29·0	29·4	21·0	7·3	5·7	0·3	—
— II south - - —	%	0·8	7·2	14·2	23·1	21·1	12·7	13·8	5·5	1·5	—

The mean length varying between 24·35 cm. and 24·90 cm.
The decrease of herring between 26 and 30 cm. should be noted.

		Age.								
Winter rings		2	3	4	5	6	7	8	9	> 9
Years		3	4	5	6	7	8	9	10	> 10
Year-classes		1934	1933	1932	1931	1930	1929	1928	1927	< 1927
Group Sandettié-Dyck	%	8·5	46·0	14·4	15·3	8·1	5·5	1·8	0·3	0
— I north of the Somme	%	8·0	67·6	13·7	6·6	2·3	1·0	0·6	0·1	0
— II south - - —	%	14·9	54·0	12·6	8·9	5·6	2·6	1·3	0·1	0
Mean of 3 Groups	%	10·5	55·9	13·6	10·3	5·3	3·0	1·2	0·2	0

4. Larval Herring.

elgium.

On the stations of the monthly hydrographical ne Deal—Gravelines tow-netting was carried out. he catches of larval clupeids were very poor.

ngland.

The collection of this material was carried out in anuary and February, but not in December, 1938. he material available is now being worked up.

ermany.

Due to bad weather a few hauls only were made ith the "Larvennetz" on the cruise of the "Elbe" November—December 1938.

Preparations were started for publishing the herring rvae material so far collected and partly already orked up. Artificial hatching of herring larvae could ot be made in 1938, due to lack of time, but has een planned for 1939.

cotland.

No herring larvae of spring origin were observed the collections taken during April and May at ne south end of the Gut, on the Great Fisher and ogger Banks or between Dogger and the Longstone. few larvae, however, were secured in the plankton auls in deeper water off Egersund, just north of ne boundary line of the Southern North Sea area. uring October, herring spawn was observed in the omachs of cod and whiting on East Bank (rectangle 9a), north of Bruceys Garden. Yolk-sac larvae ere also taken in moderate numbers in the immediate eighbourhood, indicating that hatching had not ite reached its peak in this region of late autumn awning. Slightly larger larvae were secured off t. Abbs and east of Berwick Bank in much greater umbers. Apparently large numbers of autumn larvae ere being transported southwards from the Scottish st coast, as indicated by the mixing of the size roups. Dispersal, however, in a south-easterly rection east of the Prime Meridian had not taken ace on a large scale during October month, but nsiderable movement towards the Forth and the erwick coast was indicated by the accumulations larvae in these regions.

5. Herring Races.

ngland.

Vertebrae counts for certain age-groups of fish ave been continued, mainly as a means for iden-fi ation.

rance.

For the year 1938, the mean vertebral number in ne three herring groups of the Southern North Sea nd the Eastern Channel was:

yck-Sandettié group	56·543
orth Somme I group	56·585
outh Somme II —	56·535

Once more a distinct reduction in the mean vertebral number is observable as compared to numbers recorded by previous experiments.

This reduction has been characteristic ever since 1931. Without too early wishing to state cause and effect, one is inclined to connect the reduction with the drop in phosphate-contents noticed in Channel water since 1931 by the Marine Biological Laboratory at Plymouth.

IV. PLAICE.

1. Survey of Stocks and Landings.

Denmark.

According to the hauls made by the "Dana" the age-composition in the southern Horns Reef area between 10 and 30 m. depth in May—June and August was the following:—

Age group:	I	II	III	IV	V
Year-class.....	1937	1936	1935	1934	1933
Percentage.....	40	40	18	2	0·02

The actual number of the III-group (year-class 1935) has increased to four times the number of the same age-group in 1937, and more or less twice the number of the same age-group in each of the years 1934, 1935 and 1936. Thus the year-class 1935 has been considerably richer than the preceding ones. The strength of the year-class 1936 seems to have been about the same as that of the year-class 1935. The decrease of the number of a single year-class during the year 1937 to 1938 has been considerably less than during the preceding three years.

Corresponding to this change in the age-composition, the size-compostition had changed to the advantage of the fishery. The number of plaice above 25 cm. found per fishing unit was more than ten times greater than it was in 1937 and about $1^3/_4$ times greater than in 1936. The number of plaice of 20—24 cm. was about four times the number of each of the two preceding years. The outlook for the replenishment of the stock of commercial plaice during 1939 has thus improved.

For the smaller plaice a comparison is more difficult on account of the fact that not all the fishing experiments in 1938 were taken at the same season as those in the preceding years.

Samples from the commercial catch off Thyborön in October exhibited the following percentage distribution of the age-groups:

Age-group	II	III	IV	V
Year-class.....	1936	1935	1934	1933
Off Thyborön	29 %	65 %	5 %	0·5 %

(212 fish investigated on 27th Oct. 1938.)

The year-class 1935 in this area formed two thirds of the catch — the same proportion as found for this year-class in the commercial catches from the autumn of 1937.

On the occasion of the transplantation of plaice from the North Sea to the Belt Sea and the Sound, otoliths were examined from 751 plaice taken with the Danish seine in April off Skallingen and between "Vyl" and "Graadyb" lightvessels. These plaice were about 17—25 cm. long, and the percentage distribution of the age-groups was as follows:

Age-group:	II	III	IV	V
Year-class	1936	1935	1934	1933
Percentage	7	83	10	0·4

Corresponding to the comparative richness of the year-class 1935 the percentage of the age-group III had increased from 74 % in 1937 to 83 % in 1938.

Of the plaice taken for transplantation from the North Sea to the Limfjord otoliths were examined from 1074 plaice caught in April with the Danish seine off Thyborön. The length of these plaice was about 16—23 cm., and the percentage distribution of the age-groups was as follows:

Age-group:	II	III	IV	V
Year-class	1936	1935	1934	1933
Percentage	48	49	2	0·1

In the Nissum broad the fishing experiments with the Eel-tog during June and September gave the following average number of plaice of the different age-groups per 30 minutes haul:

Age-group:	I	II	III	IV
Year-class	1937	1936	1935	1934
Number, June 1938	197	121	10	0·4
Number, Sept. 1938	75	43	1	—

It is remarkable that no plaice of the 0-group were caught during the September experiments, indicating that the year-class 1938 has been poor. The numbers of the I-group and of the II-group (1937 and 1936 year-classes respectively) were considerably less than normal.

Measurements were continued on the Esbjerg market on the various categories of plaice landed in March, June and September; altogether 17,046 fish were dealt with, and otoliths were taken from about 330. As compared with the previous year an increase in the average length of up to 5 cm. was found at the outer parts of the fishing grounds. At the eastern grounds an improvement in the amount caught was due to the recruitment from the relatively strong year-class 1935. North of the latitude of Horns Rev the great majority of plaice of 26—30 cm. length caught belonged to this year-class. South of the latitude mentioned, where the growth-rate of the recruiting plaice is less, the main part of these plaice in June originated from the 1934 year-class.

Material of the 0-group was collected in the Waddensea area off Esbjerg as in previous years, the young-fish trawl being used for this purpose in August and in September. The average catch per hour was very low, in August 70 specimens per hour's haul, in September 82 specimens per hour's haul, the average for both months amounting to 78 as against 434 in 1937 and 285 in 1936. The year's brood accordingly seems to be scarce in the area concerned. Investigations in other parts of the Southern North Sea will show whether the year-class generally proves to be as weak as in the Danish Waddensea area.

England.

The routine otolith collection of each trade category of plaice was continued at Lowestoft and Grimsby. The numbers of fish which were weighed, measured, and otolithed, is shown in Table I. The 1938 material

Table I.

Number of Plaice measured, weighed, and otolithed.

Lowestoft.

1938	Dead Small	Small	Best Small	Small Medium	Best Medium	Slabs, Large and Best	Total
April	582	660	400	151	125	74	1,992
July	512	601	382	150	124	72	1,841
October	487	532	339	120	110	63	1,651
December	471	480	303	119	90	59	1,522
	2,052	2,273	1,424	540	449	268	7,006

Grimsby.

1938	Chats	Small	Big Small	Middles	Best Medium	Large Best	Large	Total
March	474	509	377	302	184	130	78	2,054
June	418	464	351	266	198	86	86	1,869
September	376	417	373	284	144	112	89	1,795
December	481	463	366	286	169	98	72	1,935
	1,749	1,853	1,467	1,138	695	426	325	7,653

able II.

rcentage Number of Plaice landed in each Age-Group at Lowestoft and Grimsby in certain Months of 1937—1938.

Port	Date			Age-Group II	III	IV	V	VI	VII	VIII	IX	X	XI+
			Year of Birth	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926
imsby ...	Dec.	1937	Percentage	1·6	18·3	32·2	27·6	5·3	4·0	2·5	4·3	0·8	3·3
westoft ..	Dec.	1937	—	3·9	33·2	31·7	18·2	4·8	2·8	1·3	2·1	0·7	1·3
imsby ...	Mar.	1938	—	6·7	34·0	29·3	15·8	4·2	2·9	1·7	2·6	0·5	1·9
			Year of Birth	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927
westoft ..	April	1938	Percentage	—	10·3	39·9	31·0	13·8	2·1	1·2	0·6	0·7	0·4
imsby ...	June	1938	—	0·2	14·0	45·8	25·3	7·7	1·2	1·3	0·5	1·4	2·6
westoft ..	July	1938	—	0·6	21·4	43·2	22·5	8·4	1·6	1·1	0·5	0·6	0·2
imsby ...	Sept.	1938	—	0·8	17·2	29·9	28·6	13·2	2·6	2·4	0·7	1·9	2·8

s been worked up, with the exception of the tober sample at Lowestoft and the December nples at both ports and the percentage numbers each age-group shown in Table II may be compared h those for 1931 to 1937 given in previous reports[1]). An examination of the data shows that it is not y to estimate the strength of the individual r-classes owing to a marked acceleration in the e of growth. This increase was noted for the 1932 r-class in the last year's report and is evident in succeeding year-classes, and is particularly ticeable in the 1935 year-class. Taking this into nsideration there does not appear to be any lication of any particularly plentiful year-class ng present in the marketable stock, but there is me evidence that the stock spawned in 1933 will ve to be below the normal strength.

ance.

A study has been commenced on the stock of ice in the Southern North Sea and the Eastern annel; this will be continued in accordance with international programme.

rmany.

As last year, the plaice stock of the German Bight s been investigated during an extended cruise of "Makrele", permitting thus a comparison with "Poseidon" investigations of 1929—1933. These estigations were supplemented by observations in neighbourhood of Helgoland during summer and umn. A total of more than 18,500 age-determinons were made on material collected at sea.

The density of the stock in the German Bight in y 1938, was not greater, slightly less rather, than that of May 1937. The average catch per hour, calculated on basis of the "Poseidon"-gear, was 692 individuals of two-year plaice or older (as against 545 in 1929, 881 in 1930, 1,160 in 1931, and 721 in 1937). This is rather surprising when considering the favourable conditions of replenishment: the 1935 year-class (the III-group) must have been just as rich as the 1925 year-class (both year-classes seem to be found in greatest density in the northern part of the area). The year-class 1936 is almost as well represented, and so is the year-class 1934, judged from last year's observations. The reason for the small total-density of the stock is the quick decrease in individuals of each year-class within a single year; thus, the year-class 1934 was reduced in numbers by 76 % when ageing from the III-group to the IV-group, the 1933 year-class by 85 % from group IV to V, a reduction much heavier even than the corresponding ones for the quick-growing year-classes 1925 and 1926, i. e., between the investigations of 1929 and 1930. This speeding-up of the decrease in numbers we consider due to an increase in fishing intensity. The fact cannot be due to earlier emigration only, on account of quicker growth, conditions of which are somewhat similar to those of 1929/1930. Thus, seen from a biological and fisheries point of view, conditions have only little improved in 1938 within the German area of observations, apparently in contrast to the Danish area.

Accordingly no great increase is shown in German landings, which again have been subject to age-determinations from samples (total 9,600 specimens). As last year, the IV-group (now year-class 1934) constituted the major part of the landings, by 5·7 mill. individuals. Next comes the III-group with 2·4 mill. indv. (year-class 1935), while the 1933 year-class as the V-group still accounts for 1·2 mill. indv. In respect of quantity, the older year-classes are of no importance. The year-class 1933, in strength as well as growth very similar to the 1927 year-class, has — up to the age of 5 years—contributed no more than 6·3 mill. indv. to the German cutter-yield,

[1]) See Rapp. et Proc.-Verb., LXXXV, 2e partie, p. 43, 3. — LXXXIX, 2e partie, p. 44, 1934. — XCIV, partie, pp. 36—37, 1935. — C, 2e partie, pp. 60—61, 6. — CV, 2e partie, pp. 42—43, 1937. — CVII, partie, p. 49, 1938.

while the 1927 year-class during the same number of years supplied no less than 13·4 mill. — This confirms the observations of last year from which it was concluded that the German cutter fishery does not benefit from the plaice stock to the same extent as in previous years. Considering the growth of the fleet as well as fishing power, the conclusion must be that for some years the exploitation of the plaice stock of the south-eastern North Sea has been less rational than before.

A report on the investigations of 1937 has been printed (33).

Holland.

Samples of young plaice caught off the Dutch coast have been age-determined. Market measurements at Ijmuiden where some 7,000 specimens of the smallest market category — Small III — were measured, gave the remarkable result, that considerably smaller plaice had been landed than in 1937, and still worse as compared to 1932, as will be evident from the following table:—

Plaice, Small III, at Ymuiden.

	1932	1937	1938
Total number examined...	16,000	13,160	7,340
- weight of samples in kg.	2,288	1,557	822
Below 23 cm. (by number)	22·7 %	40·5 %	55·2 %
— - - (by weight).	16·2 %	33·7 %	48·2 %
Average length.....	24·2 cm.	23·4 cm.	22·9 cm.
Total weight landed (mill. kg.)	2·2	1·9	1·8
- number - (- ind.)	15·5	16·3	15·7
Undersized (mill. ind.).....	3·5	6·6	8·7

Scotland.

A sample of small plaice from a depth of 11—15 fathoms was secured in November from the North Shields area for comparison with the Scottish material. These fish ranged from 19 to 29 cm. and consisted chiefly of groups II and III, i. e., year-class 1936 and 1935.

2. Rate of Growth.

Belgium.

A study between the relation of size and age of pleuronectids has been started in collaboration with the "Station Aquicole" of Boulogne.

Denmark.

In the southern Horns Reef area, in June, the average length of each of the age-groups I—III was about the same as the length of these age-groups, respectively, in June 1937, when comparing the same depth zones. The increase in density of the stock has been too small to diminish the growth of plaice.

Germany.

The growth-rate in the German area of investigation has again increased somewhat; this agrees well with the fact that the density of the stock has not increased as further north in the south-eastern North Sea. The significant fact that only the II-group is slightly smaller in 1938 than in 1937 can be related to the increased number of the very youngest plaice. The younger age-groups being at present comparatively numerous, the older ones especially scarce, the weight-density of the stock is as low as that of 1929, while the density by number (see also IV. 1) is somewhat higher.

3. Marking and Transplantation Experiments.

Denmark.

300 plaice were transplanted from the Horns Reef area to the Tail End of the Dogger Bank, and liberated here on 22nd April. The experiment was successfully carried out, the mortality being negligible owing *inter alia* to fine weather. The specimens were in fine condition when liberated. The percentage of returns up to now has amounted to 13·3 %. The increase in size has been very high as previously. 92·5 % of the recaptures are landed by Danish, 7·5 % by English fishermen.

In the eastern part of the area the following marking experiments with plaice were carried out:

Number marked	The fish caught	Liberated	Date
100	Off Thyborön	56°21′ N. 7°40′ E.	26.4.1938
100	Off Thyborön	off Thyborön	19.5.1938
100	12 SM. WSW. of Thyborön	off Thyborön	25.10.1938

England.

A paper concerning the evaluation of results of marking experiments has been published (20).

Scotland.

No transplantation experiments were effected during the year. Recaptures from the Haisboro' liberations (October 1937) continue to be recorded and the total recoveries at the end of 1938 amounted to 50·3 per cent. Seven of the fish have so far been re-taken in Scottish waters.

4. Eggs and Larvae.

England.

Very little useful material was collected in the plaice egg cruises, owing to bad weather conditions. No lightship work has been carried out since February.

5. Racial Investigations.

Denmark.

Racial investigations were made on plaice taken from the "Dana" in the Horns Reef area; on plaice caught in the Horns Reef area and off Thyborön for transplantation to the Belt Sea and the Limfjord; and on plaice from commercial catches.

V. Sole.

enmark.

Material was collected for determining the age of e soles caught by the "Dana".

ermany.

Collection of material for age-determination, easurement and sex-determination has been con-nued as usual.

Hauls with the "Larvennetz" were made by the Makrele" during her May-cruise for investigation of e spawning of sole in the German Bight.

olland.

Market measurements at Ijmuiden on sole gave even worse record catch of smalls than that ported for plaice. The table shows the records r Small III:—

Sole, Small III at Ymuiden.

	1937	1938
otal number examined	48,840	24,383
- weight of samples in kg...	4,004	1,843
elow 21 cm. (by number).....	32·0 %	55·2 %
— - - (by weight).....	25·7 %	46·4 %
erage length	21·6 cm.	20·8 cm.
otal weight landed (in kg.)....	35,000	82,000
- number -	425,000	1,093,000
ndersized	136,000	604,000

Especially during winter the number of sole below cm. was unusually high.

VI. Other Fish.

enmark.

The age-determination of the **dabs** taken by the hing experiments in the Horns Reef area was ntinued. Race investigations were carried out as ll. Measurements and material for age-determi-tion was secured of all other species of economic lue, as e. g., **turbot, whiting,** etc.

Two papers concerning the dab were published 3, 31).

ance.

The studies commenced in 1934 on the composition the sprat shoals in the coastal waters off Boulogne ve been continued. The biology of the mackerel the North Sea has been investigated.

C. SHELLFISH

ermany.

Artificial breeding of **oyster** larvae at the List/Sylt tion of the "Biologische Anstalt" has been success-ly carried on; further experiments, however, on ring the young spat are necessary.

As the year before, the "Biologische Anstalt" has ried out bacteriological investigations on oysters d **mussels.**

D. BENTHOS AND DEPOSITS

Denmark.

During the cruises of the "Dana", bottom sampling was carried out at all trawling stations, partly using the Petersen grab (0·2 m.² and 0·1 m.²), partly the van Veen grab.

For the investigation of the effect of trawling on the bottom invertebrates samples were taken near the lightvessels "Graadyb", "Vyl" and "Horns Rev" partly in the areas worked by trawlers, partly in the areas protected from trawl fishing by the anchors of the lightvessels.

A considerable number of trawlers had been fishing around the "Graadyb" lightvessel during the first half of May, but neither near this nor the other lightvessels any difference could be recorded as to number or size of the bottom invertebrates between the areas worked by trawlers and the areas protected.

During the year the Skalling laboratory got a new laboratory building in Esbjerg; by courtesy of the "Department of Coastal Service" a building in the harbour of Esbjerg was altered to serve scientific purposes and contains now three laboratory rooms, magazines, two bedrooms etc. The laboratory of the Skalling peninsula will still serve for field investigations while the Esbjerg laboratory is intended for such work as will require technical equipment or facilities of transport by land and by sea. Investigations were carried out on the Skalling on *Statice* and *Armeria* by Dr. Johs. Iversen and on the ecology of the intermediate region between land and sea, especially in protected coasts with salt-marsh formation by Dr. Ellinor Bro-Larsen. These researches were combined with experimental work carried out in the Physiological Institute in Copenhagen. The determinations of the rate of sedimentation started in 1931 were continued by Dr. Niels Nielsen.

Dr. Thamdrup has completed the researches on animal communites in Ho Bay and has prepared the publication of results. Determination of the stock of 0-group plaice has been continued (cf. B. IV. 1).

In collaboration with the "Department of Coastal Service" (Vandbygningsvæsenet) and Esbjerg harbour a series of work concerning the tidal area of Graadyb has been carried out from April to September:

1. Tide observations.
2. Current measurements in deeps, creeks and sand-flats.
3. Determination of the amount of tidal water passing the Graadyb and secondary deeps.
4. Determination of the salinity from about 20 stations, each series covering 13 hours.
5. Determination of the content of suspended matter at the same stations.
6. Quantitative plankton investigations from six stations. The material was collected on the same days as the samples for salinity titration and the samples for determination of suspended matter.

A new apparatus for providing water samples for the determination of suspended matter from the

layers near the bottom was constructed (NIELSEN).

Three papers concerning deposits and bottom fauna were published during the year (29, 30, 34).

England.

It was found on one voyage of the "George Bligh" that the animals near lightships, where trawlers cannot easily work, were no more abundant and not markedly different from those on neighbouring grounds further away, where there is regular trawling. It was also found that repeated towing of a trawl with chain tickler on a small strip of ground damaged and killed heart urchins. Damage to other animals was not observed or was doubtful.

France.

Studies on dredge-samples collected by the "Président Théodore Tissier" in 1936 (10).

Germany.

A full report on the bottom fauna of the deep water gut near Helgoland has been published (7). Six community regions were determined, characterized by the distribution, density, and mixture of *Nucula nucleus*, *Amphiura filiformis* and *Echinocyamus pusillus*. The endobiosis of the deep water gut is indicated as the "*Nucula nucleus* community" which lives on hard bottom. In south-east on soft bottom an *Amphiura* community is to be found. The presence of shells from *Ostrea edulis* and *Chlamys varia* in the sediment of the gut is noteworthy; obviously these animals have previously lived here and a change of fauna has since taken place.

The decapod crustacean *Callianassa subterranea* MONTAGUE has been studied at Helgoland; this species is important as fish-food, but due to its hidden habitat it is difficult to catch and thus but little known. A relevant paper has appeared (28); it deals with other species of the genus *Callianassa* and describes the larval development of *C. subterranea*.

Scotland.

Investigations on the general biology of the various species of *Pandalus* were continued. *P. borealis* was found in fair numbers in the Farne Deeps.

E. PLANKTON

Denmark.

On the "Dana" cruise in April ordinary routine plankton sampling was carried out at several stations.

England.

Twelve cruises were made by the research steamer "George Bligh" and two by the motor drifter "Onaway" in connexion with which plankton samples were taken.

The investigations which have been carried out in previous years in connexion with the ether-soluble matter of the Hensen net plankton and upon the relation of the phytoplankton concentrations to the shoaling of the herring and the feeding and breeding of zooplankton have been continued.

Both on the cruises made in connexion with the plaice egg investigations at the eastern end of the Channel and in the south-western North Sea and on the stations made in the Flamborough—Dogger area, unusually heavy diatom growth was met with in the winter months. In the latter district the diatoms rose to their maximum for the year in March instead of between May and July, as has usually been the case. The important diatom *Rhizosolenia styliformis* was abundant throughout the winter and rose to an unprecedented maximum for the area in March. In October, this species was lightly distributed throughout the English east coast region, and a cruise made in November showed it to be widely distributed in an area running north-east of the Yorkshire coast and over the Dogger Bank towards Norway. Such patches as were formed by this diatom and *Biddulphia sinensis* did not appear in sufficient density or extent to interfere with the East Anglian herring fishery.

Three papers concerning plankton investigations were published during the year (18, 35, 36).

France.

A paper concerning the connexion between salinity and the distribution of the genus *Sagitta* in the North Sea was published (9).

Germany.

On a cruise of the "Makrele" in the German Bight, from 16th to 28th May, the distribution of macroplankton was studied and samples taken of surface plankton at all the main and numerous secondary stations.

These investigations into the macroplankton serve to extend the knowledge acquired in recent years of the indicator species characterizing different kinds of water in winter. It becomes increasingly apparent that the conditions in the German Bight are more complex in the warm season than in the winter when the differences between the waters seem to be more pronounced and easier to perceive. It will be necessary to procure further information concerning the value of the various plankton forms as indicator species during the warmer season.

An extraordinary feature observed during the May cruise, and also later off Helgoland, was the occurrence of larvae of *Echinocardium* in very large numbers.

In December, the Channel medusa *Turritopsis polycirrha* was found off Helgoland; on the 28th, five species occurred in the plankton taken for laboratory use in the roadstead. A strong inflow of Channel water must have taken place at the end of the year, which is also indicated by high salinity.

The distribution of the small plankton of the surface in the inner German Bight was studied on several cruises of the "Makrele", i. e., besides in May, on 22nd to 25th June, 4th to 7th, 17th, and 20th to 23rd July.

On the July cruises a narrow net of stations was

rked for bacteriological studies of sea water at ious depths, in connexion with hydrographical ervations. The different water masses can be inguished according to pollution from sewer teria, microplankton and hydrographical pro- ties. A report will be published on the results of se investigations. The sampling instrument has n described in a paper (32).

otland.

April: The usual tongue of mixed water with a nparatively rich plankton was found close to the Scottish coast. This plankton included *Calanus*, *itta elegans*, decapod larvae etc. In the region of Gut, the plankton became noticeably poorer and *itta setosa* dominated the catches. An abundance *Oikopleura labradoriensis* was found near Montrose nk. Young fish were not abundant, sandeels and g rough dabs being the most common. A patch *Rhizosolenia styliformis* was found at the southern of the Gut, about 56° N. Lat. and 2° E. Long.

May: The same tongue of rich plankton (as in ril) was found close to the Scottish coast. *Calanus* s abundant at the Long Forties. Further east, the ical *S. setosa* condition was found, but mixed nkton was observed from Ling Bank to Egersund. this area *S. serratodentata*, *Calanus hyperboreus* other exotic forms abutted against *S. setosa* and e was considerable mixing. *Oikopleura labra- ensis* was very abundant, and in this mixed area ew herring larvae were taken.

n the southern section of the May cruise herring ae were absent, but plankton consisted of an ndance of *S. setosa*, *Aglantha* and inshore types medusae, chiefly *Obelia*, *Schistomysis ornata* urred towards the tail end of the Dogger. Near Firth of Forth the *S. elegans* condition was again ountered.

October: The southern section of this cruise gave nost interesting series of plankton samples. The of stations from the Forth to the Gut showed adual change from an area of fairly high Atlantic tent on Mar Bank, were doliolids, young hake, an abundance of *S. elegans* were found, to the tern edge of the Gut, where a typically rich tacean plankton was observed, including *Thysa- sa*, *Themisto*, *Mysis*, *Calanus*, *Cumacea*, and pod larvae with *Aglantha*, *Tima bairdii* and *egans*. Within the southern end of the Gut the tacea were much reduced in numbers and *S. setosa* *Aglantha* dominated the catches while east of Gut *S. setosa* was abundant almost to the entire usion of other species. The line of stations from Abbs to the western end of the Dogger Bank ved approximately the same trend of events but a wider area of mixed plankton and more ence of vertical layering.

F. HYDROGRAPHY

Denmark.

Routine observations of temperature and salinity were secured from all stations in the area during the "Dana" cruises. Current measurements with the "Vertical Log" were made from the "Horns Rev" lightship during January and February (vide CARRUTHERS 6).

England.

Current measurements with drift indicators and Vertical Logs took place on the "Varne", "Galloper", "Sandettié", "Cromer Knoll", and "Royal Sovereign" lightvessels. Surface drift-bottles were released each week from the "Smiths Knoll" lightship. Surface samples on steamship routes have been continued. The maintenance of this work has been made possible by the courtesy of Trinity House and the owners, masters and officers of the vessels concerned.

France.

Observations on lightships and steamer routes have been continued (cf. under A).

Germany.

The usual hydrographical observations were made at all stations in spring and summer on the stations of the "Makrele" cruises as well as from the R. F. S. "Elbe". Otherwise, observations were limited to the usual lightship and liner observations. The data from lightship observations in 1937 are published in the *Meereskundliche Beobachtungen auf deutschen Feuerschiffen der Nord- und Ostsee*, Jahr 1937, Hamburg 1938.

A number of hydrographical papers from our area have been published (12—17, 24—27).

Holland.

Hydrographical surface observations on temperature and salinity from lightships and liners have been continued as usual. Current observations with the improved Carruthers current-meter have been made from lightships.

Norway.

Surface sampling (temperature and salinity) on the steamer routes Bergen—Newcastle and Bergen—Rotterdam has been continued.

Scotland.

Conditions were slightly but definitely below normal along the northern edge of the Dogger Bank when the "Explorer" operated there in the first half of May. In October the position was even more definitely sub-normal, temperatures on the surface being from 1° to $1^1/_2$° below average.

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TRANSITION AREA COMMITTEE

1938.

H. Blegvad.

Denmark.

blogy. (H. Blegvad).

The vessels used for the research work in 1938 re: the S/S "Biologen" (April—October) and a tor-boat (July—August).

Plaice. The Johansen young-plaice trawl was used ng the coasts during the summer from the motor- t (see Figs. 1 and 2). Along the north-west coast of land (Thyborøn—Skagen) the catches of plaice of 0-group were considerably below normal and in northern Kattegat slightly below normal; in the thern Kattegat, the Sound, the Belt Sea and the tern part of the Baltic proper the catches, however, re considerably above normal being nearly as rich the good survival years 1932, '34 and '35. The hes of the I-group were on the whole slightly ve normal.

Fishing experiments with the "Tog" were, as ally, carried out throughout the Transition Area. e stock of young fish (the year-classes 1936 and '37) s slightly below normal in the Tannis and Aalbæk s; in the Aalborg Bay (western Kattegat) the stock poor just as in the previous year. In the Belt the stock of young plaice was about normal. In ordance with the fact that the 0-group was recorded be above normal by the coastal investigations in 7, this year-class was now dominating among the k of young fish. The year-class 1936 was but rly represented. Of the rich year-class 1935 some specimens only were left. Obviously this rich r-class had been exhausted by the fishery already an age of $2^1/_2$ year.

In the Sound the stock of older and larger plaice (e III—V-groups) was larger than elsewhere in the thern Kattegat and the Belts; no doubt this is to the comparatively strong protection of the ice in the Sound, the fishing by otter-seines being hibited here.

In the autumn of 1938, just as in the autumn of 7, rather rich commercial catches of young plaice e made along the north-west coast of Jutland. ording to age analyses carried out in October 8, the year-class 1935 was now, as in the preceding r, dominating in the catches, as it appears from following analyses:—

Year-class	1936	1935	1934	1933	?	
Number of plaice	121	316	18	1	6	= 462

In the coastal waters of the northern Kattegat corresponding age analyses (also from October, 1938) gave the following results:—

Year-class	1937	1936	1935	
Number of plaice	28	253	38	= 319

Thus the stock of marketable plaice was younger here than outside the Skaw, the year-class 1936 being the predominating one. Marking experiments were carried out in both areas. The percentage of recoveries was for the first two months in the waters inside the Skaw about 45 against 12 in the catches outside the Skaw.

The transplantations of undersized plaice from the North Sea were continued. During April and May 1938, 193,925 kg., or about 2,100,000 individuals (i.e., slightly more than in 1937) were transplanted from the Horns Reef Area to the Belt Sea, the southern Kattegat, the Sound and the western Baltic. From the North Sea off Thyborøn channel, 137,500 kg., or 1,485,000 individuals (about the same quantity as in the previous year) were transplanted to the inner broads of the Limfjord.

The results of the Belt Sea transplantations (as well as of the Limfjord) were satisfactory in all respects. The results of the transplantations to the Belt Sea have steadily improved during later years as will be seen from the recoveries of the marked plaice and from analyses of commercial catches:—

Transplantation of the year:	1936	1937	1938
% of marked plaice recovered during the first 9 months[1]	5·0	11·0	12·5
percentage of transplanted plaice in the commercial catches	9	18	34

Other Flatfish. In the Belt Sea the stock of young dab is increasing, in some cases obviously to such a degree that the food available for the young plaice is considerably reduced. Also the stock of young

[1]) only marketable fish considered.

Fig. 1. Number of Plaice of the 0-Group (year-class 1938) taken per fishing unit in the summer of 1938. The fishing unit used was a 30 minutes haul with the Johansen young-plaice trawl.

Fig. 2. Number of Plaice of the I-Group (year-class 1937) taken per fishing unit in the summer of 1938. The fishing unit used was a 30 minutes haul with the Johansen young-plaice trawl.

Fig. 3. Total Number of Herring Larvae taken per 30 minutes haul with a 2 metres stramin ring trawl in the autumn of 1938. — Where more than one figure is given at one station, the upper one indicates catch in the upper layer (0—15 metres depth), the lower figure catch near the bottom.

flounder is increasing especially in the western Kattegat; in the Aalborg Bay the flounder is now dominating on the old nursery grounds of the plaice.

Cod. During the spring fishing with ring-trawl in the inner Danish waters (south of Anholt) it was observed that the number of cod larvae was exceedingly high and far above the normal, and later on during the summer unusually large quantities of bottom stages of the 0-group were caught in the "Tog". The stock of older cod from the I-group and upwards was only small.

Herring. The extent of the spawning of the autumn herring was examined by means of ring-trawl fishing (Figs. 3 and 4). In the northern part of the Great Belt the quantities of larvae were about normal, in all other areas, however, only poor, although larger than in 1937. The long series of bad brood years for the autumn herring of the Belt Sea and the adjacent waters is thus still continued.

Mackerel and Eel. Forecasts of the yield of the fishery were published by Aage J. C. Jensen in *Dansk Fiskeritidende*.

The investigations concerning the fishery for **Norwegian Prawn** and **Norwegian Lobster** were continued. Whereas the fishery for Norwegian lobster is still increasing, the catches of Norwegian prawn were poorer in 1938 than in 1937. No doubt measures for protection of the stock of these animals are highly desirable.

The Mitten Crab has been observed in few more localities; a few egg-bearing females were recorded but still no young specimens.

Bottom Invertebrates. As in former years, valuations of the sea bottom have been undertaken by means of the Petersen bottom sampler. In the Limfjord the amount of first-class food animals for the plaice was about normal. Outside the Limfjord valuations were carried out in the Belt Sea (in the

4. Number of Herring Larvae of 5—9 mm. length taken per 30 minutes haul with a 2 metres stramin ring trawl in the autumn of 1938. — For explanation of figures, see Fig. 3.

as to which plaice are transplanted), round Bornn, and in the Oder Bank area.

Plankton. As in former years, vertical hauls with s of fine gauze and with the Hensen net have been de fortnightly or weekly from various lightships the Kattegat and the Belts. Vertical hauls with Hensen net were carried out in the spring and the autumn in connexion with the ring-trawl ing.

Investigations of **Fish-Diseases** and of the **Disease the Eelgrass** were continued. Although a comparely strong new growth of eelgrass was observed certain parts of the northern Belt Sea, the stock the extent of the disease is on the whole as in preceding years.

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Germany.

In the year under review cruises into the Baltic were made with the R.F.S. "Poseidon" during February—March, July—August and October—November. In the western Baltic (Kiel—Warnemünde) the experiments were carried out by members of the "Institut für Meereskunde" of Kiel. Besides hydrographic and plankton work reported on by Prof. Wattenberg (see below), fish larvae investigations constituted the main part of the programme. Prof. Schulz reports on the work carried out east of Warnemünde in the Gotland and Bornholm basins (see the report of the Hydrographical Committee). In conjunction with these, mainly hydrographic, cruises on which numerous catches were made with the Hensen egg-net, special fishery investigations were carried out in the Bornholm and Arkona basins under the guidance of Dr. Strodtmann dealing with the spawning of plaice and cod. In April, May and July, furthermore, investigations with fish cutters were made in the waters off Rügen and Pomerania in order to study the distribution of herring and flatfish larvae. Further studies were made from the "Poseidon" on the frequency of young plaice in the coastal area of Pomerania. Corresponding investigations in the western Baltic could not be made before the second half of August.

Report by Dr. Kändler.

Plaice. As in the two preceding years the yield of the 0-group of plaice caught in the western Baltic was very poor (see Fig. 1). In 40 hauls, totalling $6^1/_2$ hour duration, 22 plaice of the 0-group and none of the I-group were caught. Even if the fishery investigations may have been handicapped by unfavourable weather conditions there can be no doubt that the year 1938 also produced very little brood in the western Baltic.

This failure is all the more striking as quite satisfactory catches of 0-group plaice were made in the Pomeranian waters. It was our aim to ascertain the earliest possible occurrence in the year of the youngest bottom stages. Dr. Krüger succeeded in catching off Kolberg, on July 6th, fairly great numbers of small plaice (26—38 mm. length) in depths of 18—20 m. In more shallow waters one single fish only was found. Corresponding experiments east of Sassnitz gave no results as the fine-meshed gear was wrecked several times by the many shells on the bottom. Near the shore some small plaice of 33—46 mm. length were caught. Hauls with the shrimp trawl at the beginning of August on the "Poseidon" cruise gave good catches of young plaice (until 89 per 10-min. haul) on the northern end of the Oder Bank. The area of distribution was chiefly at depths of 12—15 m. The length of the 0-group was 30 to 60 mm., the average 43 mm. Thus 1938, in the Baltic proper, was evidently a good year for the plaice. This is very satisfactory to the fisheries as the rich year-class 1934 by now has been subject to a very heavy toll and the next year-classes, 1935—1937, are moderate or even very poor. Consequently the yield, which had temporarily risen to 2,350,000 kg. in 1937, has since dropped considerably, to about 700,000 kg. in 1938. In the spring of 1938 the stock of spawners in the Bornholm basin was chiefly composed of fish of the 1934 year-class. Their quantity was not so great, however, as one should have expected from this rich year-class, and this provides a good evidence for the intensity of the fishery before the fish spawned for the first time. The number of the plaice eggs was not very great in March (up to 20 per m.²) the spawning having already culminated. North-east of Sassnitz a number of plaice larvae (up to 5 per haul) were caught at the end of April at depths of 25—40 m. They lived chiefly in the lower water layers, the largest larvae (12 mm.) being in the beginning of the process of metamorphosis.

Flounder. The decrease in the stock of flounder which has caused a serious decline in the fishery yields of later years (from 6·4 mill. kg. in 1934 to about 4 mill. kg. in 1938) is noted in the Bornholm basin investigations also from the relatively small catches of spawning flounder. Spawning began rather early in all parts of the Baltic. In the western Baltic a fair number of eggs were recorded at the end of February already, in the Baltic proper—in small numbers—at the beginning of March. The year's spawning does not seem successful; in the young fish investigations the occurrence of the 0-group was generally found to be small. At the east coast of Rügen the larvae also occurred as early as the end of April, but they were much less frequent than in preceding years. These serious indications of a progressing decrease of the stock are well worth our attention.

Drepanopsetta. During July and November rather great numbers of the I-group of Drepanopsetta were caught in the Kiel and Mecklenburg bays. They had developed from the larvae, on whose transport in May 1937 through the Great Belt to the Baltic was reported last year. Single specimens were ascertained also in the Arkona basin and in the northern part of the Bornholm basin.

Cod. The cod also began spawning early in the year. At the end of February already 300 eggs per m² were counted south of Langeland, a number which was not reached in the preceding year until four weeks later. Further east the spawning was delayed. In the deep basins of the Baltic proper it began—with greater intensity—by mid-March. While spawning in the western Baltic is finishing in May it lasts here until late autumn. There seems to be here a continuous spawning during which—especially in the Bornholm basin—large quantities of eggs (100 to 300 per m.²) are always present. At the end of October there were still some cod eggs in the egg-net hauls. Thus the cod spawn here from March to October throughout eight months. During spring, summer and autumn large quantities of mature and spent cod could be caught, 1-hour hauls of 200—350 kg

ot being rare. In order to give an idea of the composition of the shoals the frequency of the maturity ages in the female cod of the Arkona and Bornolm basins are given below (in percent.):—

	Date	II	III	IV	V	VI	VII
rkona basin....	4·3	7	16	48	26	3	..
	6·8	21	..	..	2	18	59
	31·10	55	31	..	..	..	14
ornholm basin..	8·3	23	6	37	26	8	..
	4·8	21	..	3	12	16	48
	28·10	48	..	..	..	13	39

In the Arkona basin spawning was about finishing eady in August, in October some female still mained although a long time after their spawning; e majority of the ovaries were already recuperating, any were again ripening. In the Bornholm basin % were still ready for spawning by the beginning August (in the Danzig basin 28 %), and even at e end of October a number of running females tage VI), partly half-spent, were found. The other h were spent (stage VII) or had already recuperated aries (stage II).

Large-scale race investigations corroborated the servations of September 1937 that the cod spawning ring late summer and autumn have a lower average mber of vertebrae than those spawning in spring. close study of the material is under preparation.

Herring. The investigations into the spawning of ring herring in the waters off Rügen have been ntinued. As in the preceding year two spawning riods were reckognized from the occurrence, at e end of May, of two length groups. The chief awning places were in the Greifswalder Bodden, e Strelasound and in the Swinemünde Bay.

In order to understand the composition of the rring and sprat stocks of the Kiel Bay unsorted mmercial catches are being regularly counted since e autumn of 1938.

Mackerel. In the Kiel Bay rather large quantities mackerel eggs were found by mid-July. Most of em had evidently been carried from the Kattegat rough the Great Belt, but some spawning had obably taken place in the Kiel Bay.

Publications.

Kändler: Untersuchungen über das Laichen des Ostseedorsches im Herbst. Kieler Meeresforsch., Bd. 2, 1938.

Strodtmann und R. Kändler: Die fischereiwissenschaftlichen Arbeiten der Ostsee-Abteilung Hamburg-Kiel. Ber. Dtsch. wiss. Komm. Meeresforsch., Bd. 9, 1938.

H. Henschel: Beobachtungen über den Schollennachwuchs in der westlichen Ostsee in den Jahren 1935—37. Ber. Dtsch. wiss. Komm. Meeresforsch., Bd. 9, 1938.

Report by Dr. Fischer.

Transplantation of Plaice. In 1938 as in former years rather large quantities of young North Sea plaice were transplanted into the Baltic, and again a certain number were marked for control. The results of these marking experiments were good and not inferior to those of the preceding year. The liberations of recent years have given great practical results. According to our investigations 50 % of all plaice caught in the area of liberation—the Lübeck Bay—consisted of well-grown North Sea plaice. Lack of material prevented a transplantation in the autumn of large North Sea plaice.

Herring and Sprat. The investigations carried out from 1933 to 1935 on the effects of the trawl fishery on the Baltic stocks of herring and sprat have again been taken up on a large-scale basis. The earlier investigations could not give convincing evidence of a detrimental effect of this fishery, but since the danger for an uneconomic destruction of young fish seemed inherent in a further development of this fishery these new experiments have been started specially for investigating these problems. Simultaneously we shall try continuously to survey the herring and sprat fishery as has been done for years with the flatfish fisheries. In due consideration of the importance of these questions the material will be worked up without delay and published in the *Zeitschrift für Fischerei*, where this year the material of recent years will be given.

Eels. The investigations into the migrations of the silver eel on the German coast, especially the waters round Rügen, have been continued. The relations between cosmic and meteorological influences on the drift of the emigrating eel were specially studied.

Flatfish and Cod: see the report of the Baltic Area Committee.

Salmonid: see Salmon and Trout Area Committee report.

Hydrography and Plankton. (Dr. Wattenberg.)

The hydrographical and chemical investigations begun in the Kiel Bay in 1937 were extended on the "Poseidon" trips in February, July and October, 1938, also into the Mecklenburg Bay as far as the Darss Sill (Cp. report of the Hydrographical Committee, p. 62). Despite the different seasons and the varying weather conditions the salinity distribution showed in its main features a remarkable agreement. In the western part of the Kiel Bay there were always much higher salinities than in the eastern part, although the mouth of the Great Belt, through which occurs the inflow of water of high salinity, lies in the eastern part. The difference is also obvious in the chemical factors and in the plankton, while high content of nutrient salts and rich plankton are found parallel with high salinity. In the west there are manifest all the phenomena of a eutrophic sea area which are apparent also in the poverty of oxygen at the bottom and in an incompact black sediment which is very rich in organic matter.

Plankton observations were made by Dr. KREY concurrently with the hydrographical-chemical investigations. In addition to quantitative measurements of micro- and nannoplankton, the chlorophyll content of plankton per litre of water was determined.

Norway.

Fisheries Directorate. (PAUL BJERKAN).

Sprat. The occurrence of sprat in the Oslo Fjord during the 1938 season was less than usual, and the fishery for the canning industry being finished at the beginning of August the quantity was relatively small. The sprat were also more lean than usual—contrary to the experience from the west country during the same season. The fishery took place chiefly from Hvaler and inwards. Some fish were caught in the inner Oslo Fjord also but they were—as usual—smaller, while farther west, along the Skagerak coast, the sprat fishery was unimportant. Samples of fry from the area showed varying lengths and indications of originating from several consecutive spawnings. At the end of September the length curves were multi-peaked and ranged from 5 to 9·5 cm. Vertebral counts also verified the assumption that the brood had resulted from a comparatively long-lasting spawning, the average vertebral numbers being slightly below 48·00, rising—according to length groups—from about 47·55 to 48·40 for length groups 6—9 cm., for which sufficient counts were available.

During July a cruise was undertaken with the M/S "Johan Hjort" along the southern coast, with the chief object of collecting plaice of varying lengths. From Boknfjord in west to Færder off Oslo Fjord 38 hydrographical stations were made in sections perpendicular on the coast. Furthermore, shore-seine and shrimp-trawl hauls were made from Egersund to the inner Oslo Fjord for collecting plaice material. In several shore-seine hauls in the area of Lillesand to Arendal large occurrences of cod fry were recorded in the coastal region.

Biological Laboratory of the University at Oslo. (JOHAN T. RUUD.)

During July/August, 1938, Dr. T. BRAARUD and Dr. J. T. RUUD made a 3-weeks cruise with the M/C "Morild" in the inner part of Oslo Fjord. General hydrographical observations of temperature, salinity and oxygen content were made at 49 stations, chiefly in sections, during the periods 19th—21st July and 1st to 4th August. At the same stations quantitative phytoplankton samples and vertical zooplankton hauls were made. Parallel analyses of oxygen content according to the methods of WINKLER and ALSTERBERG were carried out for all samples, and several comparative experiments of the two methods were made. Further, bottom samples were taken at 72 stations with the Hjort and Ruud bottom sampler in order to chart areas of "dead bottom". Also, oxygen conditions immediately above the bottom and oxygen consumption by the mud were studied. Experiments for determining the thickness of the productive layer at various sections of the fjord were carried out by E. RUSTAD, cand. mag., using bottles with phytoplankton cultures and with raw plankton. The late K. BANG-HANSEN, cand. mag., and C. F. WIBORG, cand. real., took part in this cruise.

Early in summer echo soundings were made in the inner parts of the fjord by the small lifeboat "Idun".

Flødevigen Hatchery. (ALF DANNEVIG.)

With the exception of January the winter 1937/8 was very mild, and the conditions for buying cod for hatching purposes were consequently very good. A total of 651 cod were bought and hatching was started on February 1st. The hatching proceeded normally. A total of 242 million fish were liberated, but the demands for cod fry far exceeded this number.

Cod. The age of some 1000 cod was determined, and some five thousand small cod as well as a certain number of whiting and pollack were collected for counting of vertebrae.

Out of 288 cod marked in 1937, 131 were recaptured by the end of 1938. 8 specimens only had migrated more than 5 km. from the place of liberation. As an example of the cod growth off the Skagerak coast the following measurements of a cod marked on 25th January 1936 and recaptured on 10th January 1939 may be mentioned:—

on marking	length 27 cm.,	weight 170 g.
at recapture	— 59 -	— 2,200 -

The year-class 1938 is very strong off the Skagerak coast; our investigations in the coastal regions show that the catch off the Skagerak coast is twice the normal. In Oslo Fjord the autumn investigations gave the following figures for cod fry per haul:— 1938: 131; 1937: 1·3; 1936: 4·5.

The investigations into the vitality of newly hatched cod fry have given interesting results. They show that cod fry living on phytoplankton do not seem to thrive, but those living on crustaceans look much more vigorous.

Lobster. The rearing of lobster was started on 22nd June and finished on 30th August. 52,000 fish were reared to stage IV, a certain number to stages II and III. Markings have been continued at Lista and Gamle Hellesund.

Oysters. The very cold winters 1935/6 and 1936/7 have caused a great mortality among the oysters at the Skagerak coast. The winter 1937/8 was mild and mortality fairly reasonable. Growth conditions for larvae were varying. A relatively high mortality in early summer was probably a result of the quality of the larvae. At Flødevigen the production was estimated at some 200,000, some 50 % of which were set out in September. In spite of liberal use in the tanks of fertilizer, the growth of the larvae was not quite satisfactory, but after liberation in autumn it has been excellent at most places. The control of the tanks has been carried out this year by ELSE FAGERLUND, cand. mag.

ydrography, Plankton.

In the coastal waters and in the fjords 220 hydro-aphic stations were made; in Oslo Fjord complete ctions were made in February, March, April, May, uly, and October. During the spring cruises 312 auls with the egg-net and the young-fish trawl ere made.

Sweden.

iology. (K. A. Andersson.)

Haddock. The investigations concerning the rate growth of the youngest year-classes have been ntinued. The collection, too, of statistics of the ndings at Göteborg market has been continued.

Plaice. The investigations of plaice have been rried out on the same lines as previously. During e autumn of 1938, fishing experiments with the hansen young-fish trawl were made on the western d southern coasts of Sweden in order to study the rength of the stock of the 0- and I-groups. The group was stronger than during the previous year d especially in the southern part of the Baltic, here the 0-group also occurred on the east coast of kåne up to Kivik. The 0-group along the Scanian ast has not appeared in such numbers since 1934. uring the investigations in the southern Baltic, arch 1938, it was proved that the strong year-class 1934 still dominates the catches by 52—54 %. he plaice of this year showed an average size of 25 nd 29 cm. During May 120,000 small plaice were ansplanted from the North Sea off Thyborøn to the ay of Laholm and 100,000 to the Skärgård of Bo-uslän (Gullmarfjord 60,000 and Hakefjord 40,000).

Witch. Statistics similar to those of haddock have en collected in Göteborg's fishing harbour.

Turbot. It deserves to be mentioned, that the group of turbot was exceptionally rich, especially the east coast of Scania. The following table cords the largeness of the catches of the 0- and groups per 30 min.-haul at some stations.

	0-Gr.	I-Gr.
ämpinge	8	1
stad, Saltsjöbad	5	3
ndhammaren	7	6
rnahusen	8	—
ivik	62	—
ockbacken	3	—
örvik	18	3

Herring. The study of the daily variations in the rtical distribution of herring fry has been con-nued during the autumn in the Kattegat.

Samples have been collected for age determinations.

Sprat. Investigations have been continued on most the same lines as before. Above all, efforts are concentrated on following the variations of the year-classes and the composition of the stock during the summer and autumn sprat fishing. In conjunction herewith, daily reports have been collected of the fishing and its localizing and the landings of sprat at the most important markets. During the year, the correlation between the sprat fishing inshore and certain climatological and hydrographical factors has been subject to special investigation. The results obtained are to be published as soon as possible in a paper by Dr. Molander based on many years' investigations of the west coast sprat.

Nephrops norvegicus. An investigation on the biology of *Nephrops norvegicus* during the year has been commenced. Fishing experiments from the "Skagerak" have been carried out at different seasons in the Skagerak and the Kattegat in order to ascertain the composition of the stock at different localities and at different seasons, and to study the propagation and the growth-rate. A number of 200 individuals have been marked and liberated in the inner part of the Gullmarfjord. Experiments have also been made by keeping *Nephrops norvegicus* in aquarium for studies of moulting and embryonic development.

Plankton. The plankton material collected monthly during the years 1935—1937 from the Gullmar Fjord and the fjords off Uddevalla is being worked up.

A number of **prawn** species (*Macrura, Natantia*) in Swedish waters, whose developments are more or less unknown, have been the subject of studies. Through hatchings in aquariums, the first larval stages have been brought forth. Some older larval stages have been collected in plankton samples in the Skagerak, the Kattegat and in the Gullmarfjord.

An investigation into the occurrence, in August—September, of dirt on herring nets in Öresund showed a mass-appearance of *Melosira moniliformis*.

Publications.

K. A. Andersson: An Investigation into the Alterations in the Growth-Rate of the Haddock. Rapp. et Proc.-Verb., Vol. 108, I, No. 13, 1938.

Hans Höglund: Über die horizontale und vertikale Verteilung der Eier und Larven des Sprotts (*Clupea sprattus* L.) im Skagerak—Kattegatgebiet. Sv. Hydr. Biol. Komm. Skr., N. S., Biologi, Vol. II, No. 3, Stockholm 1938.

Arvid R. Molander: Investigations into the Growth-Rates of the Common Dab and the Flounder in the Southern Baltic. Rapp. et Proc.-Verb., Vol. 108, I, No. 14, 1938.

— Omplantering av rödspotta. Göteborgs and Bohus läns havsfiskeforenings årsbok, Göteborg, 1938.

Hydrography. (H. Pettersson.)

(See the report of the Hydrographical Committee, p. 64).

BALTIC AREA COMMITTEE

1938.

By

K. A. Andersson.

During the year 1938 the work was devoted mainly to the study of cod, plaice, flounder, herring and sprat.

The following are the reports of the work carried out by the various countries:—

Denmark.

Biology. (H. Blegvad).

Investigations were carried out from the "Biologen" and its motor-boat during July in the waters round Bornholm and east of Rügen.

Plaice. In the waters round Bornholm at depths between 25—90 m. fishing with the eeltog yielded very few plaice only, all of the older year-classes. In the Adler Ground area a few young plaice of the I—III-group were caught. As in former years fishing with the Johansen young-plaice trawl and the hand push-net were carried out along the shores of Bornholm (see Fig. 1). The number of plaice of the 0-group was considerably above normal but far below those of the rich years 1928 and 1934.

In Prorer Wiek (east of Rügen) a 30-min. haul was made with the Johansen young-plaice trawl, the catch was 16 plaice of the 0-group. In deeper water (9—42 m.) east of Rügen 10 hauls were made with the eeltog, one of these, 16 miles ESE. off Sassnitz, recorded the 0-group (3 in all). Only a few specimens of the older plaice (I-group +) were caught on the Oder Bank as well as in the coastal waters. Thus the rich year-class 1934, which in 1937 was caught here in large quantities, had disappeared.

The number of anal fin rays of the 0-group was as follows:—

Bornholm	W. coast	50·28	(29 spec.)
—	S. coast	50·33	(30 —)
—	N. and E. coast	50·27	(37 —)
East of Rügen		48·37	(16 —)

Flounder. The catch of the 0-group in the waters round Bornholm is plotted in Fig. 1. On the whole the 0-group was more poorly represented than in the two preceding years. In Prorer Wiek (east of Rügen) a single haul with the young-plaice trawl yielded no less than 380 fish of the 0-group per 30 min.

Turbot. The number of the 0-group was—as in 1937—somewhat below normal.

Cod. The number of cod of the 0-group was somewhat above normal in the waters round Bornholm as well as east of Rügen; the I-group was fairly well

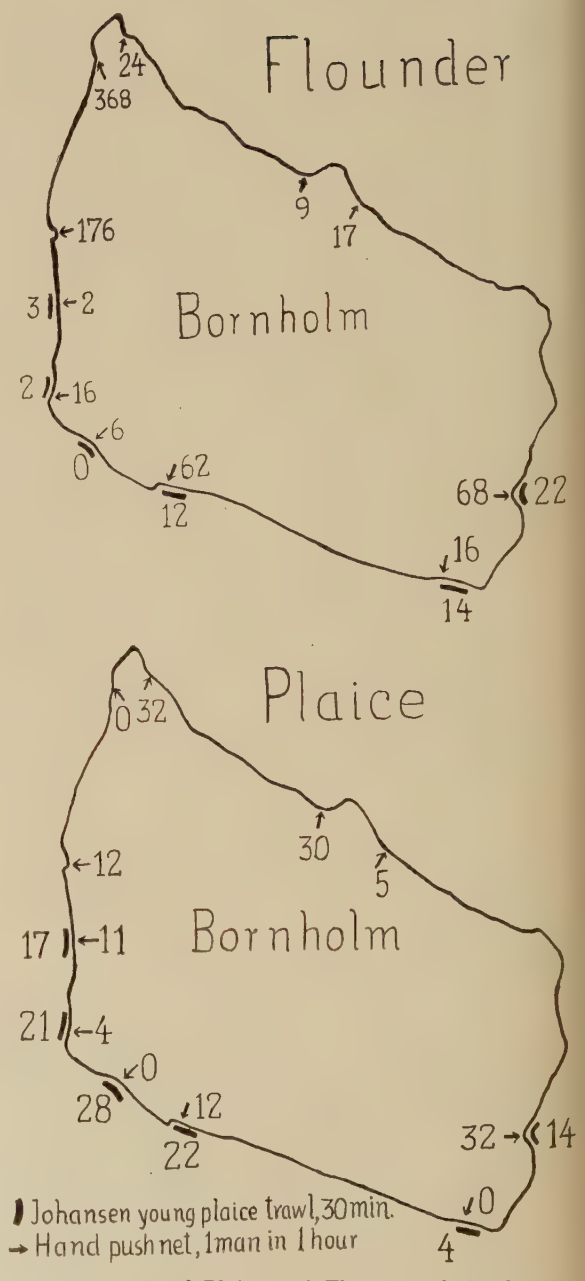

Fig. 1. Catch of Plaice and Flounder of the 0-group.

presented in the catches; among the older cod ught in deeper waters the III- and IV-groups minated.

Herring. In the deeper waters east of Rügen all herrings of 7—10 cm. length were caught in rly great numbers.

Valuations of the Sea Bottom were carried out in e waters round Bornholm and east of Rügen.

Finland.

ology. (T. H. Järvi).

Salmon scales have been collected for analysis as fore (see the report of the Salmon and Trout Committee). Statistics of the seals killed in the Gulfs of thnia and Finland were collected.

Hydrography. (See the report of the Hydrographical Committee, p. 62.)

Germany.

eport by Dr. E. Fischer.

Flatfish. The permanent observations of landings flatfish have proved a necessary measure for the ntrol of the stock of flatfish; consequently, they ere continued as usual. The results of the plaice d flounder investigations from 1929 to 1937 have en finished and the publication is now in press[1]). A special study was made during 1936/8 of the **aice** of year-class 1934, its entry into the fishery, growth and its importance to the German plaice hery. Dr. Altnöder wrote a paper entitled "Der hollenjahrgang 1934 in der mittleren Ostsee" ich has been published in the "Berichte der eutschen Wissenschaftlichen Kommission für Meeresrschung", N. F. Bd. 9, H. 2. This paper, among her questions, deals with the changing yield of the ltic fishery during 1936 and following years due the presence of the year-class 1934. The catch of aice rose from 4,861 mill. kg. in 1935 by 9,994 mill. . in 1936 to 23,490 mill. kg. in 1937. In 1938 the ld declined again to 6,836 mill. kg., the year-class 34 then (age-group IV) having been fished out and ruits lacking from other good year-classes. The ar-class 1934 thus furnished a typical example of e dependence of fishery yields on fluctuations.— awning conditions were studied through cutter ises to the spawning ground during the spawning iod. It was ascertained that the year-class 1934— th the exception of a few males—did not enter the awning until 1938. The year-class was, however, t poorly represented on the spawning grounds as e bulk had already been taken by the fishery.

The marking experiments on **flounder** in East-ussian waters, started in 1935, were finished. The arking of flounder in the Frisches Haff proved that e young fish entering the Haff at a length of 4 cm. or more, return to the Baltic at the end of their third or fourth year or partly even later. 16·9 % of the 325 fish liberated were recaptured. The following fish were received:—

	from the Haff	from the Baltic
1935.....	11	0
1936.....	11	33

The emigration from the Haff takes place when reaching maturity, but since immature fish also occur in the Baltic, presumably other impulses also (food migration for instance) influence the stock. Among the flounder caught in the Baltic few only had moved far from the place of liberation (Rügenwalde, Carlshagen).

From the marking experiments it may be concluded that the flounder from the Frisches Haff does not represent any local stock but one identical with that of the Baltic area outside the Haff. This is confirmed by the corresponding number of anal fin rays of flounder from the Haff and the East-Prussian coast off Neukuhren. The difference is 0·18 ± 0·20. On the other hand, however, there is a variation from the spawning flounder of the Bornholm basin for instance the difference amounting to 0·85 ± 0·17.

The growth of the liberated flounder is illustrated by the following table:—

Month of Catch	Recaptured in the Frisches Haff 0 1 2 3 4 cm.	Recaptured in the Baltic 0 1 2 3 4 5 cm.
1936 II.....	- - - - -	1 - - 1 - -
III.....	3 1 - - -	1 - 1 - - -
IV.....	1 1 - - -	- 2 - 1 - -
V.....	- 1 - - -	1 3 1 - 1 -
VI.....	- - - 1 -	2 1 2 2 - -
VII.....	- - - 1 -	1 2 3 - 1 -
VIII.....	- - - - 1	- - - - 1 1
IX.....	- - - - -	- - - - 1 -

Parallel with the Haff marking Baltic flounder were marked off Neukuhren; 194 fish were liberated; the recapture of 25·2 % was distributed as follows:—

1935	1936	1938
13	34	2 fish

The migrations showed nothing of importance. Almost all marked flounders were recaptured fairly close to the place of liberation and no long migrations were noted. These results of the marking experiments and of the above-mentioned investigations into the morphological characters prove that the flounder stock of the East-Prussian coast constitutes a separate stock. They do not migrate to the Bornholm basin but remain in their native grounds where they spawn later than the Bornholm flounder. As a rule, spawning does not finish until June.

The growth of the flounder is seen from the following table:—

[1]) They will appear in the series: Ber. Deutsch. Wiss. mm. Meeresforsch., N. F.

Year	Month	Growth Increment 0	1	2	3	4	10	12 cm.
1936	II	-	-	-	1	-	-	-
	IV	-	-	1	-	-	-	-
	V	2	3	5	-	-	-	-
	VI	2	5	3	1	-	-	-
	VII	-	1	2	2	1	-	-
	VIII	-	1	3	-	1	-	-
	IX	-	-	1	-	-	-	-
1938	VIII	-	-	-	-	-	-	1
	X	-	-	-	-	-	1	-

The results of both experiments have been given in a report[1]).

Herring. In a paper about to be published[1]) the results of the race investigations into spring and autumn spawners from Rügen waters will be described. The two forms are characterized as follows:—

	Number	Vert. praeh.	Vert. S.	Av. length
Spring-herring	992	$23{\cdot}32 \pm 0{\cdot}026$	$55{\cdot}66 \pm 0{\cdot}020$	22·69
Autumn herring	783	$24{\cdot}35 \pm 0{\cdot}047$	$55{\cdot}49 \pm 0{\cdot}022$	19·75

Cod. The yield of the German cod fishery has increased continuously during recent years as shown by the following figures:—

Year	Quantity (in million kg.)
1931	27·980
1932	34·186
1933	41·135
1934	44·464
1935	54·613
1936	71·002
1937	103·180
1938	112·415

This growing intensity of the fishery has caused a close investigation of the cod stock to be started. Already at the beginning of 1938, material was collected by cutters from a series of fishing grounds along the Baltic coast from Schleswig-Holstein to East-Prussia. This material was continuously supplemented and carefully analyzed. Further, marking experiments were carried out, and gave the following percentages of recapture:—

Place of Marking	Date	Number liberated	Percent. recaptured.
Eckernförde	19·II·38	199	8·0
Warnemünde	13·V·38	124	2·4
Kolberg	13·III·38	246	14·2
Neukuhren	31·III·38	229	3·9

The marked cod were mostly recaptured near the place of liberation and nothing can be said therefore about migrations.

[1]) Published in Ber. Deutsch. Wiss. Komm. Meeresforsch., N. F.

Report by Dr. Kändler.

Eggs and Larvae. In so far as the work has been carried out in conjunction with the investigations within the Transition Area the results are recorded by that Committee. During the cruises of the R.F.S. "Poseidon" in March, July/August, and October the stock of spawning fish in deeper basins and the young fish stock of the coastal area were investigated. The result of the spawning in 1938 is quite satisfactory for the plaice but poor for the flounder.

The hydrographical cruises—during March as far as south of Gotland, during July as far as Landorttief —offered an opportunity of studying the distribution of pelagic fish eggs. The spawning intensity of the cod, which is decreasing eastward, is characterized by the following maximum figures per m.² recorded, at the end of July:—Bornholm basin, 185; Danzig basin, 68; Gotland basin, 12. In the latter depression, pelagic cod eggs were not found at depths of less than 170 m. or more, and with a salinity at the bottom of 12 ‰ or more. At Landsorttief with a salinity of 10·7 ‰ only and west of Gotland no cod eggs were found. In the upper layers of these waters sprat eggs occurred (up to 10 per m.²). Unfortunately in the autumn unfavourable weather conditions did not permit an extension of the work beyond the Bornholm basin, where 12 cod eggs were caught per m.² as late as at the end of October.

Latvia (see p. 58).

Poland.

(M. Siedlecki).

The marine research laboratory, formerly at Hel, was transferred to the new building, especially constructed for this purpose at Gdynia. The laboratory will now contain a department for marine biological investigations, a department for fishery research, and an aquarium connected with a small oceanographic museum. The aquarium and the museum will be opened next year; the laboratory, provided with rooms for scientific workers is ready for use.

Biological Investigations.

Quantitative studies concerning the **bottom fauna and flora** were made by means of numerous catches with the bottom sampler and by means of direct observations through a diver-helmet of a special construction. The last method was applied also to the study of animal communities living on the breakwaters of the fishery ports. The results of these investigations were published in the *Bulletin de la Station Maritime* and in the *Bulletin International de l'Académie des Sciences de Cracovie* (1938).

The development of **garfish** (*Belone acus* Risso) was studied. The spawning grounds of this fish were found in the Golf of Puck in shallow water over a bottom with rich growth of *Potamogeton*. The spawning takes place by the second half of May and early in June.

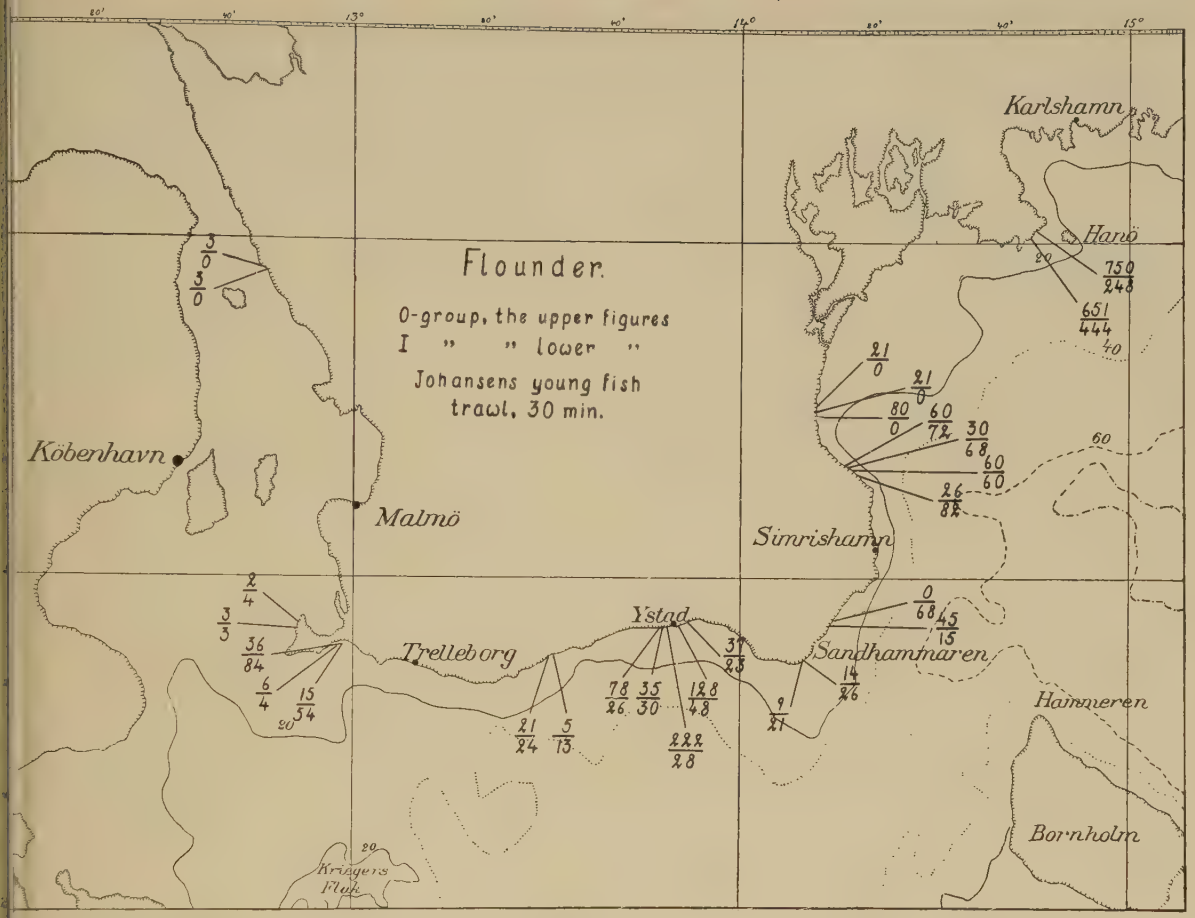

Fig. 2.

Parasites of flounders, eelpouts and other marine animals were studied and the results were published. Studies on anatomy and histology of fishes and of other marine animals were prosecuted and most of the results published.

Studies on **the flora** of the Golf of Danzig were continued and some results, especially concerning species until recently unknown from this part of the Baltic, were published in the *Bulletin de la Station Maritime*, 1938.

Fisheries Investigations.

Sprat. In the seasons 1937/38 and 1938/39 the shoals of sprat disappeared almost completely from the neighbourhood of the Polish coast. In order to investigate the causes of this catastrophe investigations were made concerning the distribution of eggs and larvae of sprat, of the quantity and quality of plankton at the fishing grounds, of the hydrographic conditions and of the distribution of mature sprat in the Gulf of Danzig after the period of the life in shoals. It was established, that the sprat in the Gulf of Danzig have not been destroyed by excessive fishing but the quantity of eggs and larvae (maximum 44 per square meter) as well as of mature individuals was very small as compared to previous years. The results of these investigations will be published soon[1]).

Herring. Investigations concerning the age, growth and composition of the stock of the two races of herrings (spring and autumn spawners) from the Gulf of Danzig were continued on the base of an analysis of a large material.

Cod. The biometrical features of the cod caught in the Polish waters were studied and the results were compared with the results of similar investigations made upon the cod from Danish waters. The results were published in *Archives d'Hydrobiologie et des Pêches*, Vol. XI.

Flatfish. The composition of the stock of flounders, and particulars concerning their sexual maturity were studied. The results of this study were published in *Archives d'Hydrobiologie et des Pêches*, Vol. XI. — Marking experiments with flounders were continued.

[1]) In the Archives d'Hydrobiologie et des Pêches.

Other Investigations.

The results of the studies concerning hydrography, plankton and salmon investigations are given in the reports of the respective Committees.

Sweden.

Fisheries Investigations.

The motor-boat "Eystrasalt" was commissioned for fishery investigations during the period May 5th to November 2nd.

The research vessel "Skagerak" made two cruises in the Baltic during March and September.

Cod. The investigations were continued along the Swedish coast from the Bornholm area in south to the coast off Örnsköldsvik in north. As a rule the stock of cod was very rich as far north as the coast off Stockholm, and the catches were good. Measurements of catches from the whole of the coast were made and samples of otoliths and scales were collected for age determinations.

Flounder. During September the distribution of the 0- and I-groups of the flounder were investigated along the coast of Scania and Blekinge. Generally speaking, the 0-group was poor but the I-group richer (see Fig. 2).

In deep water the year-classes 1933 and 1934 dominated.

Herring. The rate of growth of the herring was investigated at different parts of the Swedish coast. A great many fishing experiments were made with nets with meshes of various sizes in order to avoid selections by the nets. A great number of samples were collected for the study of age and growth.

Sprat. The stock of sprat was studied in the Skärgård to the south off Stockholm.

Hydrography.

In connexion with the biological investigations, hydrographical observations were made at all stations. (See the report of the Hydrographical Committee, p. 65.)

Latvia.

Statistics. (V. Miezis).

The Board of Fisheries and Pisciculture continued statistical work on Sea fisheries as in former years. The "Bulletin statistique des pêches maritimes de Lettonie", années 1936 and 1937 were published.

The statistical data for 1938 will be published shortly.

Biology.

The Fisheries laboratory (Ministry of Agriculture) continued as in former years the investigations of fishes of the Baltic as to race and age-composition, especially of **Flounder** (*Pl. flesus*) and **Herring** (*Cl. harengus* v. *membras*). Also researches were continued with regard to age-composition, migration and spawning circumstances of **Salmon** and **Sea trout** in Latvian waters.

The Hydrobiological Station of the Latvian University (Director Professor Dr. Embrik Strand) continued its researches on the plankton and the fish of the Latvian coastal waters and the Gulf of Riga. Mr. B. Bērziņš, Assistant of the Station, published some notes on medusae and fish and has prepared two papers on crustacea from the Gulf of Riga.

Hydrography.

According to the program of the Council the Fisheries Laboratory of the Latvian Ministry of Agriculture carried out two hydrographical cruises for investigating the sea water's chemical compounds in the Gulf of Riga and in the inner Baltic during June and October 1938.

Samples for researches were taken in the Gulf of Riga at 11 and in the Baltic proper (along the Latvian coasts) at 4 stations, each from 0 to 10 metres, and at the Gotland deep at 1 station, from 0 to 20 metres.

The sea water samples were investigated corresponding to the methods worked out by the Council with regard to: hydrogen ion concentration (pH), oxygen (O_2), chloride (Cl'), phosphate (P_2O_5), ammonium nitrogen (N_{NH_3}), nitrate and nitrite nitrogen ($N_{NO_2} + NO_3$), alkalinity and salinity ($S\,‰$).

The Hydrobiological Station of the Latvian University (Director Professor Dr. Embrik Strand) undertook as in previous years regular surface observations of t° and $S‰$. The observations will be published in "Bulletin Hydrographique" and in the "Folia Zoologica et Hydrobiologica". See Bull. Hydr.: **Hi.**

The Naval Department (Ministry of Finances) reports:

1. In order to issue a new chart of the Gulf of Riga systematical hydrographical measurements have been carried out between 56° and 57°50′ N. The direction of the profiles was from 87°—90° to 267°—270° at 3·5 km. intervals. The depths were determined by means of an Echo-Sounder of the "Atlas Werke" from the research vessel "Hidrografs". The area measured totals 5316 km². The relief of the sea-bottom is rather monotonous with the greatest depth in the centre of the Gulf where a maximal depth of 62·6 m. has been recorded. An insignificant ditch to about 63·1 m. deep was also found near Mērsrags.

The coastal waters were measured in the regions from Ventspils to Roja and from Skulte to Salacgrīva on an area of 1815 km². The quality of the bottom compounds was determined by means of special scoops to a depth of 15 cm. (A. Lende: The Bottom of the Gulf of Riga).

The results of these and previous measurements will be used in constructing a new chart of the Gulf (scale 1:250.000).

2. The observations of the sea level were continued as usual at the following points: Ainaži (Renquist—Witting mareograph), Salacgrīva (pile-gauge), Daugavgrīva (A. Ott. Limigraph), Mērsrags and Roja (stassgauges), Kolkasrags, Ventspils and Liepaja (Renquist—Witting mareographs), Pavilosta and Pape (stass-

ges). The mareograph at Ventspils entered into
on May, 1st, 1938.
The monthly and yearly averages of water levels
the whole time of observation (1870—1936) were
to "Association Internationale d'Océanographie
sique" for the edition which is to be published
Prof. PROUDMAN.
The measurements of velocity and direction of
currents by means of sheet-crosses and swimmers
e carried out from the lightship "Oviži" three
es daily, and from the research vessel "Hidrografs"
ry morning and evening before and after hydro-
ohical measurements. Weather-conditions per-
ting measurements were carried out from the light-
se of Kolka, going out by boat and anchoring at
ka buoy.
The sea motion was observed from the lightship "Oviži" according to the international meteorological code. Beginning with the summer 1939, it will be taken to obtain a more precise knowledge of wave elements.

5. The temperature of sea water was measured by the lighthouse guard once a day at Liepaja, Ventspils, Kolkasrags, Mērsrags, Daugavgrīva, Ainaži and also from the "Oviži" lightship.

6. The observations of ice and shipping conditions were carried out by the lighthouse guards as in former years. From Febr. 11th—18th 1939, the department took part in the Baltic Ice Week arranged by the Baltic Hydrological Conference (Institute for Marine Investigations at Helsinki).

The officials of the Marine Department also participated in the 6th Conference of Baltic Hydrologists at Lübeck and Berlin 13th—30th August 1938.

Reports of other Committees.

HYDROGRAPHICAL COMMITTEE

1938.

Prof. Martin Knudsen.

Belgium.

No special report has been received, but the hydrographical work has been reported in the Combined North Sea and Eastern Channel Committee report.

Denmark. (Martin Knudsen).

North-Western Area.

During the cruise of the R/V "Dana" to the Faroes from May 3rd to 18th hydrographical investigations were carried out at 52 stations.

From June 20th to July 6th investigations were made at 78 stations in sections running from the south-west point of Ireland to Reykjanes, Iceland (see Fig. 1 to the NW. Area Report in page 15). The distance between the stations was generally 20 naut. miles. At some of the stations drift-bottles were liberated.

From July 11th to 24th investigations were carried out at 30 stations round Iceland, and from July 25th to August 5th at 19 stations at the Faroes.

The four permanent sections at Iceland have been run as follows:

Selvogr Bank: June.
Vestre Horn: June.
Langanes: March, August.
Kögr: February, July, September.

At West Greenland the three permanent sections have been run as follows:

Fylla Bank: June, August.
Lille Hellefiskebank: June.
Store Hellefiskebank: June.

At Myggenæs (Faroes) the surface temperature has been measured daily, and once weekly a surface sample has been collected for titration.

Surface observations of temperature and salinity have been continued from liners to Iceland and Greenland.

Southern North Sea.

Hydrographical investigations were carried out from the "Dana" in April, June and August.

Surface observations of temperature and salinity have been collected from the line Esbjerg—Harwich as in previous years.

Daily observations of temperature and salinity (with hydrometer) from the lightships "Horns Rev" and "Vyl" have been undertaken by the Danish Meteorological Institute as in previous years.

Transition Area.

Observations of temperature and salinity, and at a few stations of oxygen also, have been carried out from the "Biologen" in close connexion with the biological investigations, mainly during the months April, May and October.

By the Danish Meteorological Institute regular hydrographical observations have been made as follows:

1) daily observations of temperature and salinity (by hydrometer) from 10 lightships and 17 coastal stations,

2) 4-hourly observations of the surface current at 10 lightships.

Baltic Area.

At Christiansø near Bornholm the Danish Meteorological Institute has made daily surface-observations of temperature and salinity (by hydrometer).

Éire.

Atlantic. (G. P. Farran).

Observations of salinity and temperature were made on the hydrographic cruises of the Fishery Cruiser "Muirchu" off the south-west coast of Ireland on April 7th—12th (22 stations) and off the north coast on August 19th—20th (10 stations). The salinities have been determined by the State Chemist, Dublin.

A summary of the daily surface temperature obsertions at Coningbeg lightship on the south coast of Ireland for the period 1925—37 has been prepared for publication.

England.

North Sea and English Channel.

(Report by J. N. Carruthers).

During the year 1938 the programme of continuous rrent-measuring from the Varne lightvessel went as during the previous eleven years. February, wever, was the last month in which use was made the Drift-Indicator. Starting with March 1938, instrument used at the Varne was the Vertical —which instrument was in use again continu-ly throughout the whole year aboard the Cromer oll and Royal Sovereign lightships. The wild ather experienced just before and on the 12th ruary 1938, when NW.'ly gales prevailed, gave to very interesting (and, in one area, disastrous) lifications of the tidal streams. The subject has n dealt with in two small publications noted below and [2]). The winter spawning-time programme of tinuous current-measuring aboard the Galloper Sandettié lightvessels was again carried out ing the months of December, January, and Febru-1938/39. This work was done with the Vertical as before, but was not accompanied by tow-net npling as it was in the last few winters. The Ministry e again acknowledges the kind co-operation of the ffice Scientifique et Technique des Pêches Mariti-s" in the case of the operations aboard the San-tié lightship.

Routine work with ordinary surface-floating drift-ttles has again been restricted to weekly liberations n the Smiths Knoll lightvessel, but greatly reased use has been made of that type of drift-ttle system known as "Route-Indicating Bottles". ese systems float deep in the water and, after a e, drop a questionnaire bottle to the sea floor, re to remain anchored until retrieved in a ground ing net. They have been made use of in studies the drift of young herring from the Forth area, from the offing of the Northumberland coast. addition, a series of them has been put out at each the six stations of the Flamborough Line, which worked monthly. The results have proved useful interesting.

As regards the flow of water from English Channel North Sea during the year 1938:—

January saw a very bold flow, under the prevalence strong SW.'ly winds; February, a month of winds n a N.×W.'ly point, witnessed conditions of l-up, and in March SW.'ly winds dominated, but a weak flow took place. The month of chief interest was April when, under the influence of dominant strong winds from a NNE.'ly point, there was a very pronounced reversal of the water flow. This month witnessed an average daily flow of more than 3 miles towards SW.—a finding the value of which is enhanced by the great reliability of the new instrument. Of the remaining months (December observations from the Varne not being available at the time of writing) the following may be said:—

In all of them there was a NNE.-going flow; this was greatest in amount in July, least in September, and of descending order of strength through the months November, June, October, August, and May. As regards wind conditions in the months after April, May was a month of NW.'ly conditions, and the following six of SW.'ly conditions. As compared with the year 1937, there was clearly a much more frequent and much stronger flow of water from Channel to North Sea. In view of an invitation extended at the last Council meeting, the observations made aboard the various lightships with the Vertical Log are reported upon by the present writer in part III of this volume (App. No. 5).

(Report by J. R. Lumby).

Routine observations of surface salinity and temperature were maintained as in previous years, with the exception of those on the Plymouth—Guernsey route. Work on this line ceased late in 1937, owing to the sale of the ship, and since a fresh distribution of the sampling activities was under consideration, no attempt was made to start this line again. The most noteworthy feature of the observations was the occurrence of high salinities mainly in the Fisher Bank region in the first half of the year.

Fourteen sections on the Flamborough Line, in all months of the year, were made with the "George Bligh" and "Onaway"; salinity and temperature observations were made, in conjunction with plankton investigations. In April salinity, temperature, and phosphate samples were taken off the English and Bristol Channels, forming part of the study of the life history of the mackerel being carried out in co-operation with the Marine Biological Association, Plymouth. In May, temperature observations were made in the Yorkshire coast—Dogger Bank region, to study the effect of the thermocline on the faunal distribution. On cruises in June, October (2), and November hydrographic observations (S, t, O_2, transparency) were made in the south-eastern North Sea (broadly the Dogger Bank region), to further the study of the relationship of plankton patches to herring shoaling. Salinity, temperature, and phosphate were studied in the Southern Bight in December, in relation to the distribution of plaice eggs.

The salinity and oxygen analyses were all made at the Government Laboratory, London, while the phosphate was determined on board ship.

(Note on the Salinity on p. 65).

Carruthers, J. N. "The Horsey Floods of Febru- 1938 — Current and Wind at the time as observed ard certain Lightvessels". Meteorological Magazine, 73, No. 868, London, May 1938.

Carruthers, J. N. "Exceptional Tidal Streams in southern North Sea and eastern English Channel". Marine Observer, Vol. XVI, No. 133, London, Jan. 9.

Finland.

Baltic. (G. Granqvist).

1. Regular observations were made as follows:—
   (a) Surface temperature daily, surface salinity every 5th day, temperature and salinity at different depths every 10th day at 27 coastal stations and 9 lightships.
   (b) Surface temperature and salinity by liners from Finland to Denmark. (Route: 41).
   (c) Currents at three depths thrice daily at 9 lightships.
   (d) Registration of the sea level at 17 stations and readings of the sea level at 20 stations.
   (e) Records of ice conditions from logs and sketch-maps at about 100 stations and by all Finnish ships in the Baltic.
2. A hydrographical cruise was made in April—May 1938 in the Baltic north of Gotland during which 59 stations were made. On this cruise samples were collected for the determination of chlorinity, oxygen and alkaline content. In addition, determinations of hydrogen-ion-concentration were made on board. (Bull. Hydr.: **Na**).

France.

See the reports of the Atlantic Slope, the NW.-Area and the North Sea Committees.

Germany. (B. Schulz).

General.

The hydrographical observations carried out in the year 1937 on the German lightships of the North Sea and the Baltic have been published in Vol. 13 of the *Meereskundliche Beobachtungen auf deutschen Feuerschiffen der Nord- und Ostsee* published by the Deutsche Seewarte". The range of the observations has been increased, since, from the 1st June 1937 onwards, the current observations taken at 4-hourly intervals from the Baltic lightships have been published in their entirety. The method of the current observations is now the same in that sea as it has been for a number of years on the North Sea lightships. Furthermore, from the 1st January, 1937, onwards the complete serial observations obtained have been published.

North-Eastern Area.

Parallel with the fishery investigations, comprehensive hydrographical investigations were carried out on three trips on the steam trawler "Heinrich Baumgarten" (**HB**) along the Norwegian coast, Barents Sea, Bear Island and Spitsbergen. The trips were made from the 13th March to 5th April 1938 (hydrographical observers Dr. Goedecke, cand. Clausen), from the 7th to 30th April (Dr. Goedecke, stud. Mertins, Kanje) and from the 28th August to 27th September (stud. Mertins, Kanje).

Transition Area. (H. Wattenberg).

(See also Transition Area Report in page 51).

The systematic hydrographical and chemical investigations in the Kiel Bight begun in 1937 by the "Institut für Meereskunde der Universität Kiel" were extended in 1938 to the Mecklenburg Bight as far as the Darss Sill. On three trips on the "Poseidon" in February, July and November, 1938, the temperature, salinity, phosphate, silicate, nitrite, transparency and yellow colouration were determined at about 50 stations at depths of 5 metres interval, the calcium, alkalinity, oxygen, pH and nitrate were also determined at depths of 5 metres and in the bottom water layer. The detailed work in connexion with the Eckernförde Bight and the Kiel Fjord was continued. In conjunction with the hydrographical-chemical investigations plankton samples were collected at selected stations in accordance with a method which combined both sieve and deposit procedure. On the autumn trip there were, in addition, carried out chlorophyll determinations of the plankton per litre of water.

The observers were Professor Dr. H. Wattenberg, Dr. Helga Meyer, and Dr. J. Krey.

Baltic.

The detailed investigation of the Bornholm Basin which was begun in earlier years was continued from September, 1937, to October, 1938, on four trips on the "Poseidon", with the object of obtaining, in addition to as synoptic a picture as possible of the hydrographical state, the seasonal variations as well. The trips were made:—

(1) from 4th to 24th September 1937 (Cp. Rapp. et Proc.-Verb., Vol. 107, II, pp. 73—74);
(2) from the 11th March to 26th March. In addition to the observations in the Bornholm Basin transverse sections were laid through the Danzig Deep and the Southern Gotland Trough;
(3) from 16th July to 8th August. Work was done in the Gotland Trough to the latitude of Landsort Deep in addition to the Bornholm Basin;
(4) from 7th October to 1st November. The investigations were confined to the Bornholm Trough.

The hydrographical investigations were carried out by Professor Schulz, Dr. Kalle, Dr. Goedecke, O. Hatje, Eschemann, Mertins, Lüneburg, and Jaeckisch.

The plankton investigations carried out simultaneously were conducted by Dr. Meschkat, Dr. Brandes, and Rothe.

Holland.

S. North Sea. (P. M. van Riel).

The ordinary surface observations of temperature and salinity on board lightships and liners in the southern North Sea were continued. (Routes: 36, 37, 38; L. V.: **Ha**, **Ma**, **NH**, **TB**).

Furthermore, hourly current measurements were carried out with modified Carruthers current meters

board the Dutch lightships. These observations ll be continued.

Iceland.

See North-Western Area Committee Report.

Latvia.

All observations have been recorded in the Bull. ydr. for the year 1938. (See also page 58).

Norway.

tlantic. (B. Helland-Hansen).

The Geophysical Institute, Bergen undertook cruise with the research vessel "Armauer Hansen" the North Atlantic. From the English Channel to e Azores in the waters north and north-west of the ands and back to the English Channel, 172 stations ere worked between 18th May and 11th July with servations of temperature, salinity and various teorological elements. (Bull. Hydr.: **AH**).

-E.-Area.

sheries Directorate (Bergen). (O. Sund).

The object of all cruises was mainly oceanographical cept no. 9 which was occupied with fishing experi- ents for Halibut and tagging, nos. 10 and 11 which ere young fish cruises while no. 13 was trial fishery the Spitsbergen banks.

ruises.

o.	Period	Vessel	Area	St.	Number of Observations t°&S‰	O_2	P	pH
	$^{25}/_{1}$—$^{9}/_{2}$	"Johan Hjort" (**JH**)	W. Coast	19	178	119	—	—
	$^{14}/_{1}$	"Arm. Hansen" (**AH**)	,,	3	34	—	—	—
	$^{15}/_{2}$—$^{19}/_{5}$	,, ,,	,,	25	191	—	—	—
	$^{2}/_{4}$—$^{5}/_{4}$	,, ,,	N. Sea	7	69	—	—	—
	$^{15}/_{2}$—$^{13}/_{4}$	"Johan Hjort"	N. Norway	208	1918	1417	226	281
	$^{10}/_{5}$—$^{20}/_{5}$	"Huseland" (**Hu**)	N. Sea	56	436	—	—	—
	$^{22}/_{4}$—$^{2}/_{5}$	"Johan Hjort"	Finmark	64	530	359	307	305
	$^{13}/_{5}$—$^{24}/_{9}$	"Virgo" (**Vi**)	SW. Fjords	34	326	—	—	—
	$^{2}/_{2}$—$^{4}/_{4}$	"Eiken" (**Ei**)	Finmark	9	86	—	—	—
	$^{5}/_{7}$—$^{26}/_{7}$	"Johan Hjort"	S. Coast	50	387	—	—	—
	$^{19}/_{8}$—$^{6}/_{10}$	,,	Tromsø	54	529	469	—	182
	$^{21}/_{11}$—$^{13}/_{12}$	,,	Bergen—Tromsø	182	1315	560	109	560
	$^{28}/_{4}$—$^{22}/_{9}$	"Solveig I" (**So**)	W. of Spitsberg and Bear Island	75	740	—	—	—

ermograph Services.

o.	Frequency per year	Liner	from	to	Route
	26	"Ariadne"	Bergen	Rotterdam	(35)
	52	"Jupiter"	,,	Newcastle	(34)
	26	"Lyra"	,,	Reykjavik	(1)
	6	"Nova"	,,	E. Iceland	(7)
	52	"Christiania"	,,	Oslo	
	26	"Lofoten"	,,	Finmark	
	6—8	"Lyngen"	Tromsø	Spitsbergen	

Water samples were collected along these routes four times yearly, at intervals of 20—40 miles.

Permanent Local Stations.

No.	Place	Depth (m.)	Lat. N.	Lg. E.
1	Sognesjøen	310	61·1	5
2	West Fjord	312	68·2	15
3	at Eggum (Lofoten)	215	68·3	14
4	at Ingøy (Finm.)	305	71·2	24
5	at Vardø (Finm.)	315	70·3	31

At these five stations fortnightly observations of temperature with collection of samples for salinity were made by a resident observer, at standard depths (0, 10, 25, 50, 75, 100, 125, 150, 200, 250, and 300 m.).

The Tromsø Museum (Tromsø). (O. Sund).

Oceanographical observations were made in the fjords near Tromsø several times during the year.

Three cruises were made to the West Finmark waters, in April, May and June respectively, about 20 stations being visited each time. In April two series of continued observations on the same spot at the mouth of the Alta fjord were made with a view of obtaining evidence of vertical oscillations at the spring and neap tide periods.

Transition Area. (See also report of this Ctee. in page 53).

Fisheries Directorate (Paul Bjerkan).

From the M/S "Johan Hjort" 38 hydr. stations were made on sections perpendicular on the coast from Boknfjord to Færder.

Biological Laboratory, Oslo University (Johan T. Ruud).

49 stations were done sectionally in the inner Oslofjord for temperature, salinity and oxygen observations on July 19th—21st and August 1st—4th.

Flødevigen Hatchery (Alf Dannevig).

A total of 220 hydr. stations were made within the Oslofjord during the months of February, March, April, May, July and October.

Poland.

Baltic. (M. Bogucki).

The State Meteorological Institute at Gdynia has made regular observations as follows:—

(1) measurement of temperature and salinity every day at three coastal stations; (**Gd, Hl, Rz**).
(2) measurement of the surface temperature and salinity by liners between Gdynia and Sund, and between Gdynia and Stockholm; (Routes: 48, 50).
(3) monthly measurement of temperature, salinity, nitrogen, phosphate, oxygen and pH at 8 stations every 10 metres; (stations: **HI—XII**).
(4) surface current observations by means of drift-bottles liberated from liners between Gdynia and Sund and between Gdynia and Stockholm;
(5) registration of the sea level at one station (Gdynia) and reading of the sea level at 3 stations.

Portugal.

Atlantic Slope. (A. Ramalho).

Une seule sortie de l'"Albacora" au mois de Janvier 1938, dans la région voisine de l'embouchûre du fleuve Tage (stations **Al** 983 à 1000).

Le navire a été soumis à des réparations pendant tout le reste de l'année.

Les observations océanographiques entreprises par l'"Albacora" en 1937 ont été publiées sous le titre de "Observaçōes Oceanográficas — "Albacora" — 1937", comme no. 43 des *Travaux de la Station de Biologie Maritime de Lisbonne.*

Scotland.

Northern North Sea. (J. B. Tait).

Scottish hydrographical work in 1938 commenced towards the end of March with a survey of northern North Sea waters north of the latitude of Peterhead to the northern limit of the North Sea, that is, to latitude 61° N. and eastward to between longitudes 1° E. and 2° E. The "Long Forties" area, southward to the Firth of Forth, was overtaken before the end of April. Commencing first May, this latter survey of the middle North Sea was extended on a wider circuit embracing Ling Bank, the south-west Norwegian coastal region, the Great Fisher Bank and north Dogger areas. The region between Aberdeen and Shetland was then "covered" intensively as a preliminary to subsequent work in the north-eastern Atlantic Ocean and the Faroe Shetland Channel.

At the instance of Professor Helland-Hansen, President of the International Association of Physical Oceanography, a cruise in the north-eastern Atlantic area was undertaken in the latter half of June, as part of an international investigation of Gulf Stream waters. The usual Scottish summer cruise in the Faroe Shetland Channel, including the Wyville Thomson Ridge and Faroe Bank areas, followed, and formed part of this survey.

Conditions in the north-western part of the North Sea were again investigated in the last week of July, to link up with the foregoing Faroe Shetland investigation. Both inner and outer west Scottish coast waters were surveyed in the first half of August. The northern North Sea in September, the middle area in October and coastal work in the Moray Firth and along the northern Scottish coast in November and December respectively completed the year's investigations.

In all, 303 hydrographic stations were occupied. Nearly 2500 combined temperature and salinity observations were taken. These will eventually appear in the *Bulletin Hydrogr.* (**Ex**) of the International Council for the Exploration of the Sea. 2960 surface drift-bottles were liberated in groups of ten from all but seven stations in close proximity to land. By the end of January 1939, 545 bottles had been recovered, representing a percentage return of only 18·4, which is even lower than that registered in respect of 1937 liberations at the corresponding date a year ago, and about 10 per cent. less than the normal return over the previous six years. No similar concentration of recoveries which, last year, followed upon a period of scarcity, has occurred during February 1939.

A summary of hydrographic conditions in the Northern North Sea during 1938 commences conveniently from this point. It will be recalled that upon the evidence of a mass of drift-bottle returns during February 1938, from the previous year's liberations, it was deduced that a strong pulsation of Atlantic water into the Northern North Sea, commencing probably towards the end of January, was then taking place. This deduction was borne out by the first hydrographic cruise at the end of March. On the Moray Firth latitude out to beyond Fladen Ground, temperatures and salinities both were above normal.

The intensity of this Atlantic incursion, however, fell away during April and May as shown chiefly by temperature and salinity data, as also from certain deductions which can be made from the drift-bottle results of these months. In the latter half of June, however, there is certain evidence of a renewed thrust southwards of the Atlantic incursion from the north between Shetland and Norway. This again fell away during August, but apparently renewed itself for the third time, in September, after which there was undoubtedly a powerful withdrawal of the Atlantic influence from the Northern North Sea.

Sweden.

Transition Area. (Hans Pettersson).

Swedish investigations have been devoted mainly to the study of submarine light with special emphasis on its angular distribution, aiming at a correct estimate

the integral illumination on a spherical body mersed in the water as determined by measurements the usual manner, i. e. by exposing a photo-element ctifying photo-electric cell) to the sub-surface light downward direction. By means of instruments ecially constructed for this purpose measurements ve been carried out in various fjords and also in e open sea off the coast. The results have been blished in *Svenska Hydrografisk-Biologiska Kommissionens Skrifter, Serie Hydrografi*, No. XIV. Apart m this registrations of sub-surface daylight have en continued during the year from Bornö Station d transparency measurements *in situ* have been rried out at various places within the area.

Other subjects investigated have been the amount radio-active elements: uranium, thorium and lium present in the sea water, an investigation rried out since 1934 in collaboration with Austrian, ngarian and Norwegian collaborators, which has en brought to a conclusion during 1938. The results ve proved that, whereas uranium is a constant mponent of sea water, varying in amount with e total salinity, radium is present only in excessively all quantities, much less than has hitherto been sumed, whereas the amount of thorium is too all for measurement. The results are being published *Meddelanden från Oceanografiska Institutet i Göteg.* (See also Part III, App. No. 9.)

Studies have also been continued of internal movents, partly from Bornö Station, partly from cruises h the "Skagerak", supplemented by regular servations from Swedish lightships off the west st of Sweden. Studies of the hydrographic and teorological factors influencing the formation of ice and of the breaking up of ice already formed have also been continued from Bornö.

Baltic Area. (Hans Pettersson).

Swedish hydrographic investigations in the Baltic during 1938 have been carried out during two cruises on the "Skagerak": 11th—25th May and 9th—28th August. The main purpose was to study the heat balance of the water in the central Baltic, an investigation carried out in collaboration with "Statens Meteorologisk-Hydrografiska Anstalt" in Stockholm. A number of hydrographic sections round Gotland and especially to the south of that island were carried out, supplemented by meteorological observations and registrations of solar radiation from fixed points of observation.

A second purpose was studying how a wind current spreads downwards from the surface, achieved by means of recording current-meters suspended from sub-surface carrier buoys at different depths.

A third object was the study of submarine daylight with special regard to its distribution over different angles, carried out by means of specially constructed instruments, used within the Baltic as well as the Transition Area. The results from the latter investigation have been published as number XIV of *Svenska Hydrografisk Biologiska Kommissionens Skrifter, Serie Hydrografi.*

Finally a study of the transparency of the Baltic waters by measurements *in situ* has also been carried out during the cruises proving that strongly pronounced variations with depth exist at depths exceeding 60 metres.

Note on the Salinity in the English Channel 1938/9.

(Communication made during Council Meeting in Berlin.)

Between July and December last year, water of her higher salinity than usual entered the English annel. In July and August salinities were about mal, tending to be a little high in the west, low the east, though the fresher areas, e.g., off the ne, had high salinities. In September the salinity he water in the mouth of the Channel was well ve normal. In October the salter water began to ct the eastern end, and by January the salinity re was from 0·2 to 0·3 ‰ higher than usual, and had fallen to rather below normal in the west. Thenceforward (up to the last observations in March) the salinity in the east tended to return towards normal.

It seems that though a not inconsiderable body of Atlantic water entered the Channel, and a few very high salinities (over 35·5 ‰) were recorded, the effect is likely to be only temporary and there is to be no repetition of the conditions which prevailed in 1921/2.

Sub-Committee on Combined Hydrographical and Biological Investigations.

accordance with the decision of the Council in 938 (Rapp. et Proc.-Verb., Vol. 107, I, pp. 25 47) the Sub-committee on future combined hydrohical and biological investigations, consisting of rs. M. Knudsen, H. Gran, Ed. le Danois, nley Kemp, and Bruno Schulz, met at Charlottenlund on November 7th and 8th, 1938, and in Paris on February 20th and 21st, 1939.—The President and the Administrative Secretary attended both meetings and Dr. E. S. Russell further attended the Paris meeting.—A series of papers received from members of the extended Committee and other

collaborators were discussed and the following Protocol, prepared at the Paris meeting, will be submitted to the Special Hydrographic-Biological Meeting and, if accepted, to the Council at its annual meeting in May 1939.

Protocol.

The Committee hoped that as an outcome of their meeting in November 1938, it might have been possible to arrange for an intensive survey of the Faroe—Shetland area for one year by collaboration between England and Germany, and that twice during this year an extended series of observations in the eastern Atlantic would be undertaken by France. The suggestion was that the "Discovery II" might have been made available for the British share of the work, but this has unfortunately been found impracticable. Germany, however, is prepared to employ a research ship for 3 months on work in the Faroe—Shetland area between April and September 1940, provided a satisfactory programme can be arranged, while France has agreed to make the Atlantic observations. The Committee feels that advantage should be taken of these offers.

It will not in the circumstances be possible to conduct a full year's survey of the Faroe—Shetland area but the Committee believe that very valuable results could be obtained by a programme extending from April to October, which would cover the period of greatest hydrographical change and the spring and autumn development of phytoplankton. The Committee considers that the work might be allocated between the different countries on some such lines as the following:—

	Faroe—Shetland Area	Eastern Atlantic
April	Scotland ("Explorer")	France ("Pr. Th. Tissier")
May	Germany ("Forelle")	
June	England ("George Bligh")	
July	Germany ("Forelle")	Eire ("Muirchu")
August	Denmark ("Dana") and Sweden ("Skagerak")	
September .	Germany ("Forelle")	
October	Scotland ("Explorer")	France ("Pr. Th. Tissier")

It is hoped that hydrographical and biological work supplementary to the main programme will be carried out by research ships of other countries working in their own areas. In particular it is hoped that Portugal may be able to undertake work between Portugal and the Azores and that Norway might make observations in the Lofoten area and Barents Sea. Additional assistance in making anchor stations in the Faroe—Shetland area would be of great advantage.

The principal objects of the work are twofold:—

Phytoplankton. To study the dependance of phytoplankton production on such environmental factors as nutrient salts, light[1]), vertical circulation and stability of water layers.

Hydrography. To study the variation in the influx of Atlantic water into the Norwegian and North Seas and to discover to what extent single lines of observations can be regarded as representative of conditions during each month. Also to find, by means of anchor stations, the influence and amplitude of internal waves.

In framing this programme the Committee had in mind the fundamental problem of studying the relation between changes in the hydrographical and plankton conditions and the fluctuations of the fisheries and the importance of discovering to what extent variation in the strength of the Atlantic inflow is a responsible factor.

It is recommended that the programme of work to be undertaken each month should consist of lines of stations radiating from the Shetlands:—one line, outward and return between the Shetlands and the Faroes, a similar double line between the Shetlands and Norway and a shorter double line between the Shetlands and the Orkneys. On the outward journeys the work should be done as expeditiously as possible to facilitate dynamic calculations, but on the return journeys more time may be spent and plankton observations with towed nets should be undertaken.

In each month an anchor station, with hourly observations, and extending over two or three days is to be undertaken, but it is not necessary that all anchor stations should be in the same position.

At each station temperature, salinity, phosphate and oxygen content should be determined, with if possible nitrate content, hydrogen ion concentration and light in addition. Samples of phytoplankton should be collected both by the sedimentation method and by the method employed by Prof. Hentschel and other plankton work should at least include standard collections of the larger macroplankton. An exact and fully detailed programme must be prepared since it is of the greatest importance that all the participating countries should work on identical lines, and with uniform apparatus and methods.

The Chairman in consultation with Prof. Gran and Prof. Schulz has agreed to draw up a detailed programme of the Faroe—Shetland work, and Dr. le Danois will consult with members of the Atlantic Slope Committee regarding details of the Atlantic programme.

The Chairman laid before the meeting a preliminary statement of the preparatory work carried out by Dr. Jacobsen on the Faroe—Shetland material collected in past years. The Committee thinks it important that this work should be completed as soon as possible.

[1]) If direct light observations cannot be effected, the influence of light may be ascertained indirectly from oxygen observations.

PLANKTON COMMITTEE

1938.

Prof. H. H. Gran.

Belgium.

No report received.

Denmark.

Home Waters.

. Dr. Steemann Nielsen has continued the mination of the phytoplankton samples collected Danish waters in 1935—36. A report dealing with yearly phytoplankton production in Danish ers will probably appear in 1939.

. An investigation on the relation of CO_2-assimi-on by diatoms to the wave-length of the light been started by E. K. Gabrielsen and Stee-nn Nielsen.

. The weekly collection of plankton samples from e lightships in the inner Danish waters has been tinued during 1938. Continuous collections have n made since 1929.

Northern Waters.

Prof. Ove Paulsen has continued the examin-n of microplankton collections from Icelandic ers, and Dr. Jespersen has dealt with the macro-nkton, from both the biological and geographical nts of view.

Dr. Jespersen has completed a report (now in press) dealing with the biology and distribution he various copepods in East Greenland waters, n special reference to the copepod-fauna in the ds.

A systematic account of the marine copepods ast Greenland has been prepared by Dr. Jesper- for publication in the series "*The Zoology of East enland*" which appears in "*Meddelelser om Grøn-*" (in the press).

Dr. Jespersen is preparing a special report on biology and distribution of the free-living copepods celandic waters; and a paper on the subject will ublished in "*The Zoology of Iceland*".

5. Some Icelandic plankton samples have been examined. The results indicate that nets yield samples which are not strictly comparable as regards quantity of phytoplankton (see publications).

III. Publications.

1. E. K. Gabrielsen und E. Steemann Nielsen, "Kohlensäureassimilation und Lichtqualität bei den marinen Planktondiatomeen." Rapp. et Proc.-Verb., Vol. 108, II, No. 4, 1938.
2. E. Steemann Nielsen, "Über die Anwendung von Netzfängen bei quantitativen Phytoplanktonuntersuchungen." Journ. du Conseil, Vol. XIII, No. 2, 1938.

England.

Lowestoft.

Twelve cruises were made by the research steamer "George Bligh" and two by the motor drifter "Onaway" in connexion with which plankton samples were taken.

The investigations which have been carried out in previous years in connexion with the ether-soluble matter of the Hensen net plankton and upon the relation of the phytoplankton concentrations to the shoaling of the herring and the feeding and breeding of zooplankton have been continued.

Results from the two cruises covering the area off the east coast of England and for the six Hensen net stations worked between Flamborough Head and the Dogger Bank suggest that 1938 was a year in which little food reserve was accumulated by the plankton as the ether-soluble matter estimates gave a lower average than on any other year in the series worked hitherto.

Both in the cruises made in connexion with the plaice-egg investigations at the eastern end of the Channel and in the south-east North Sea and on the stations made in the Flamborough-Dogger area unusually heavy diatom growth was met with in the

winter months. In the latter district the diatoms rose to their maximum for the year in March instead of between May and July as has usually been the case. The important diatom *Rhizosolenia styliformis* was abundant throughout the winter and rose to an unprecedented maximum for the area in March. In October this species was lightly distributed throughout the English east coast region, and a cruise made in November showed it to be widely distributed in an area running north-east of the Yorkshire coast and over the Dogger Bank towards Norway. Such patches as were formed by this diatom and *Biddulphia sinensis* did not appear in sufficient density or extent to interfere with the East Anglian Herring Fishery.

Publications.

1. Graham, M. "Phytoplankton and the Herring Pt. III. Distribution of Phosphate in 1934—1936." Min. Agric. and Fish., Fish. Invest., Ser. II, Vol. XVI, No. 3, 1938.
2. Wimpenny, R. S. "Diurnal Variation in the Feeding and Breeding of Zooplankton related to the Numerical Balance of the Zoo-Phytoplankton Community." Journ. du Conseil, Vol. XIII, No. 3, Copenhague, 1938.
3. — "A Routine Method for the Estimation of Fat in Plankton and its Application to Herring Tissues." Journ. du Conseil, Vol. XIII, No. 3, Copenhague, 1938.

Plymouth.

Phytoplankton. Dr. H. W. Harvey has, during the past year, worked on the growth of the diatom *Ditylum brightwelli* in natural and artificial sea water. It was found to make a moderate vegetative growth in offshore sea water, collected between October 1937 and the early summer of 1938 and enriched with phosphate, nitrate and iron. Waters collected before and after this period, similarly enriched, would not allow a vegetative growth to take place. Nor would "winter-collected" waters, which had been stored for several months in glass vessels and similarly enriched, support a growth of the diatom. It has been found that the inability of these stored waters to support growth is primarily due to lack af manganese. If this is added in the form of a manganous salt, bringing the concentration to that found by Thompson and Wilson in Pacific waters, the diatom would make a moderate vegetative growth in the stored waters. The addition of manganese was also found to allow growth in a freshly collected offshore water (November 1938), in which the diatom would make no growth without such addition.

In artificial sea water, containing Na, Ca, Mg, K, Fe, Mn, silicate, nitrate, phosphate, chloride and sulphate, the diatom would make no growth, or very little growth. On adding a water extract of soil or marine algae, it would grow vigorously and yield a moderate crop, producing 1000—2000 cells per c.c. The active principles in the algal extract were separated into two groups, by absorption on carbon and by continuous extraction with butyl alcohol. The activity of the fraction adsorbed on carbon appears due to an organic acid having either basic properties or many hydroxyl groups. An active preparation has also been prepared from winter-collected offshore sea water by adsorption on carbon. It has been found that several compounds containing the $—SCH_2CH(NH_2)COOH$ group have a similar effect upon the growth of *Ditylum*. The activity of the other fraction, not adsorbed on carbon and extracted by butyl alcohol, appears due, in part at least, to organic compounds. Several breakdown products of living organic matter, as lactic acid, gluconic acid and alanine, have shown activity. Adding a preparation containing either fraction to artificial sea water has little or no effect; a vigorous growth results only if both are added.

In experiments with stored winter-collected sea water, enriched with nitrate, phosphate and iron, but deficient in manganese, the addition of soil or algal extracts allows vigorous growth and a considerable crop of the diatom. Both fractions were necessary. If a compound containing the —S*R* group and gluconic acid were added, both to the extent of 2 mg. per litre, a moderate crop was produced, the growth being limited finally through lack of manganese. With 0·02 mg. per litre of manganese added to the water these two compounds when added in addition, increased the growth due to the addition of manganese only; the growth was then limited through lack of silica. With these two compounds, manganese and an ample supply of colloidal silica, very heavy growth exceeding 20,000 cells per c.c. were obtained.

Samples of water collected during the course of the late summer and autumn of 1938, after similar enrichment with phosphate, nitrate and irons, did not behave alike. Some would allow a moderate growth of the diatom after the addition of —S*R* only, others would not. It has not been determined whether the latter lacked the second organic accessory or manganese or both. An offshore water collected in November 1938 allowed a moderate growth on the addition of manganese only, the cells growing abnormally long in comparison with their diameter, which is symptomatic of lack of the —S*R* accessory.

Zooplankton. Mr. F. S. Russell has continued to keep watch on the changes in the animal plankton off Plymouth as shown by the weekly ring-trawl collections. The results for the year 1937 have been published and the 1938 collections have been examined up to date. The year 1938 has been remarkable for the almost complete absence of *Sagitta elegans* at all times and the very low numbers of young fish.

He has also been making a study of the nematocysts of medusae and their value as characters for use in classification. The nematocysts have proved of value in distinguishing certain species of *Aequorea* which have always been a source of considerable difficulty.

Mr. W. J. Rees has continued his work on linking the medusae with their hydroids. He has succeeded in finding the hydroid of *Dipurena halterata*, and has

lished a report including the hydroids of *Bougain-a muscoides*, *Leuckartiara octona*, *Corymorpha ata* and a species of *Aequorea*. He has also made ollection of medusae from Valentia Harbour, h-west Ireland.

rofessor W. M. Tattersall has published a report he occurrence of mysids off Plymouth.

hree plankton cruises have again been made this r by Mr. G. A. Steven and Mr. P. G. Corbin in nexion with the mackerel researches, in April, and July. They were made on dates as near e of last year as possible so that comparison may made between the two years' data. The April se was again made in the Ministry of Fisheries' arch ship "George Bligh"; the May and July ses in the steam trawler "Elk". During the April se the S.S. "Muirchu", from the Fisheries Depart-t of Eire, and the S.S. "Quentin Roosevelt" from nce were also carrying out simultaneous plankton ses to the north and south respectively of the nd worked by the "George Bligh". From the tional data thus collected it is hoped to obtain ore complete picture of the spawning activities he mackerel in April—the main spawning month an would be possible from the work of a single el.

nalysis of Phosphate. The uncertainty which sur-ded the salt error in determinations of phos-us in sea water has been largely resolved by L. H. N. Cooper so that he has now been able ompare the routine phosphate observations at rnational Station E 1 during the last six years his own and Dr. W. R. G. Atkins' earlier rvations. In the nineteen twenties the winter imum for phosphate, representing the stock lable for plant growth in the following spring, aged 0·67 mg.-atom P per cu. m. Since 1930 it has aged only 0·47 mg.-atom and the fall shows a correlation with the decrease in abundance of ner spawning young fish in the English Channel rved by Mr. F. S. Russell, and with the decrease he easting of the residual current at the Varne ship in the Straits of Dover observed by Dr. J. N. RUTHERS. Comparison with Mr. D. J. Matthews' yses made on water taken near the Knap Buoy 916 and 1917 supports the view that the rich phate of the nineteen twenties was carried in he inflow of warm Atlantic water in 1921. There yet no evidence of any enrichment of phosphate he English Channel which might lead to better val conditions for the plant and animal plankton young fish and would ultimately result in im-ement in the commercial fisheries of the south-

ications.

ooper, L. H. N. "Salt error in determinations of phosphate in sea water." Journ. Mar. Biol. Assoc., Vol. XXIII, pp. 171—178, 1938.

— "Redefinition of the anomaly of the nitrate-phosphate ratio." Journ. Mar. Biol. Assoc., Vol. XXIII, p. 179, 1938.

3. Cooper, L. H. N. "Phosphate in the English Channel, 1933—38, with a comparison with earlier years, 1916 and 1923—32." Journ. Mar. Biol. Assoc., Vol. XXIII, pp. 181—195, 1938.
4. Lebour, Marie V. "The life history of *Kellia suborbicularis*." Journ. Mar. Biol. Assoc., Vol. XXII, pp. 447—451, 1938.
5. — "Notes on the breeding of some lamellibranchs from Plymouth and their larvae." Journ. Mar. Biol. Assoc., Vol. XXIII, pp. 119—144, 1938.
6. Rees, W. J. "Observations on British and Norwegian hydroids and their medusae." Journ. Mar. Biol. Assoc., Vol. XXIII, pp. 1—42, 1938.
7. Russell, F. S. "The Plymouth offshore Medusa fauna." Journ. Mar. Biol. Assoc., Vol. XXII, pp. 411—439, 1938.
8. — "On the development of *Muggiaea atlantica* Cunningham." Journ. Mar. Biol. Assoc., Vol. XXII, pp. 441—446, 1938.
9. — "On the seasonal abundance of young fish. V. The year 1937." Journ. Mar. Biol. Assoc., Vol. XXII, pp. 493—500, 1938.
10. — "On the nematocysts of Hydromedusae." Journ. Mar. Biol. Assoc., Vol. XXIII, pp. 145—165, 1938.
11. Tattersall, W. M. "The seasonal occurrence of mysids off Plymouth." Journ. Mar. Biol. Assoc., Vol. XXIII, pp. 43—56, 1938.

Éire.

Plankton collections by means of vertical Nansen net hauls were made on the cruises of 7th—12th April 1938 off the south-west coast of Ireland and of 19th—20th August off the north coast. On the former cruise oblique hauls with a 2-metre stramin ring-net were also made for the purpose of obtaining mackerel eggs. Large quantities of mackerel eggs were found on some stations and great localised abundance, on separate stations, of other organisms, *Limacina*, *Sagitta* and *Calanus*. The material is in course of identification, partly in Dublin and partly at the Marine Biological Association's Laboratory at Plymouth, through the courtesy of the Director.

France.

A l'Institut Océanographique de Paris, le Dr. F. Bernard a poursuivi ses recherches sur la quantité de nanoplancton et de sels nutritifs, en relation avec les données hydrographiques et météorologiques. Le groupe important des Coccolithophorides est étudié au point de vue du cycle et de l'abondance des espèces, particulièrement chez *Coccolithus fragilis* et *C. leptoporus*, dominants dans les régions Atlantiques chaudes et Méditerranéennes.

Publications.

1. F. Bernard. — Cycle annuel du nanoplancton à Monaco et Banyuls. — I. Etude quantitative. (Ann. Inst. Océan., XVII, pp. 348—403.)
2. — Résultats de l'examen préliminaire des prises d'eau faites à bord du "Président Théodore Tissier" en Mai—Juin 1936. (Rev. des Trav. de l'Off. des Pêches, X, p. 337—9, Paris 1938.

3. F. Bernard. Rapport sur le plancton (Comm. Intern. p. l'Expl. sc. de la Méd. Rapp. et Proc.-Verb., XI, 1938).
4. — Répartition des Coccolithophorides dans la Mer de Monaco (C. R. du XVème Congrès des Soc. savantes, 1938).

Germany.

Hamburg.

The hydrobiological department of the "Zoologisches Institut" has continued the quantitative investigations of microplankton by means of bronze gauze sieves. This work was undertaken on a recommendation of the Plankton Committee in co-operation with various German and foreign institutions. The following cruises provided plankton series for these investigations:— three voyages in German fishing vessels to the Barents Sea, one of them as far as Spitsbergen; one voyage in a German fishing vessel to the northern North Sea; one Danish cruise of the "Dana" between Great Britain and Iceland; one Scottish cruise of the "Explorer" between Scotland and Iceland; one English cruise south-westwards from Plymouth. From March to May Professor Hentschel travelled in Icelandic cargo vessels to Iceland and round the island, in order to study the development of spring plankton by means of numerous closely spaced surface samples. On this occasion, the plankton of the Siglufjord in northern Iceland was examined twice daily during 11 days in April.

The plankton work carried out in September 1937 in the Bornholm basin in collaboration with the Deutsche Seewarte (Professor Schulz) on board the "Poseidon" was repeated three times in 1938, on the same line, in March, July, and October, and was extended in part to the Danzig Bay and the Gotland Deep. Dr. A. Meschkat, Dr. C. H. Brandes, and Mr. F. Rothe took part as biologists.

Publication.

Hentschel, E. Über die Herstellung von Plankton-karten des Nordatlantischen Oceans. Rapp. et Proc.-Verb., Vol. 107, III, No. 13.

Helgoland.

On a cruise of the "Makrele" in the German Bight, from 16th to 28th May, the distribution of macroplankton was studied and samples taken of surface plankton at all the main and numerous secondary stations.

These investigations into the macroplankton serve to extend the knowledge acquired in recent years of the indicator species characterizing different kinds of water in winter. It becomes ever more apparent that the conditions in the German Bight are more complex in the warm season than in the winter when the differences between the waters seem to be more pronounced and easier to perceive. It will be necessary to procure further information concerning the value of the various plankton forms as indicator species during the warmer season.

An extraordinary feature observed during the May cruise and also later off Helgoland, was the occurrence of larvae of *Echinocardium* in very large numbers.

In December, the Channel medusa *Turritopsis polycirrha* was found off Helgoland; on the 28th, five species occurred in the plankton taken for laboratory use in the roadstead. A strong inflow of Channel water must have taken place at the end of the year, as the high salinity also indicates.

Professor Wulff has studied the distribution of the small plankton of the surface in the inner German Bight, on several cruises of the "Makrele", viz., 22nd to 25th June, 4th to 7th, 17th, and 20th to 23rd July. Surface plankton samples were also taken on the cruise from 16th to 28th May, and on other cruises.

Professor Wulff advised Dr. Rieche regarding his expedition to Spitsbergen in 1938 and undertook himself the examination of some plankton samples brought back. He also worked up and reported on the surface plankton material taken in the Barents Sea in October 1937; his report dealt among other things with the variation of shell form in *Parafavella*.

Kiel.

On the "Poseidon"'s cruises in February, July and November the Institut für Meereskunde of Kiel University, Kitzeberg, had plankton samples taken at a series of stations in Kiel Bay and Mecklenburg Bay at 5 m. and from the bottom layer. On the November cruise chlorophyll was determined by a new method, in 15 samples from the Bornholm basin and 39 samples from the western Baltic.

Plankton observations were made concurrently with hydrographical-chemical investigations (see report of the Hydrographical Committee) and the data handed over to Dr. Krey. In addition to quantitative measurements of micro- and nannoplankton, the chlorophyll content of plankton per litre of water was determined.

Hiddensee.

Two publications on plankton production in the brackish coastal water were completed; one was a chiefly quantitative study, the other qualitative.

During the "Poseidon"'s cruise in February and March vertical hauls were undertaken with the medium Apstein net at 37 stations from the Baltic to the Bornholm basin.

Publications.

Trahms und Stoll, Hydrobiologische und hydrochemische Untersuchungen in den Rügenschen Boddengewässern während der Jahre 1936 und 1937. Kieler Meeresf. 1938.
Trahms, Das Plankton des Grossen Jasmunder Boddens. Arch. Hydrobiol. (In the press).

Holland.

No report received.

Latvia.

No report received.

Norway.

iversity of Oslo,
ological and Botanical Laboratory.

Dr. Braarud and Dr. Ruud carried out investigons in the inner Oslo Fjord during July and August board the "Morild". Observations of temperature, inity and oxygen content were made at 29 stations, which samples for the quantitative study of ytoplankton were collected and vertical hauls of oplankton also made. Parallel analyses of the ygen content were made for all samples according the ordinary Winkler method with the Alsterberg dification. Experiments to determine the thickness the productive layer by means of submerged flasks h phytoplankton cultures and raw plankton were ried out by Mr. Einar Rustad. Mr. Chr. Fr. borg and the late Mr. Kjell Bang-Hansen also k part in the cruise.

ological Laboratory. (Johan T. Ruud).

At 49 stations in the inner Oslo Fjord quantitative yto-plankton samples were collected and zoonkton hauls made.

sheries Directorate. (Paul Bjerkan).

Shore-seine hauls between Lillesand and Arendal orded extensive occurrences of cod-fry in the coastal ions.

ødevigen Hatchery. (Alf Dannevig).

512 hauls were made during the summer with egg- and young-fish-trawl.

blication.

GVE Braarud and Adam Bursa: The Phytoplankton of the Oslo Fjord 1933—34. Hvalrådets Skr., Nr. 19, Oslo.

Poland.

The phyto- and zooplankton investigations in the lf of Danzig and adjacent waters have been con- d.

. Mańkowski has brought to an end his inves- ations on the food of the Baltic sprat.

During June and July 1938 three cruises of the earch cutter "Ewa" were carried out in order to dy the intensity of the production of sprat ova the area between Gdynia—Gotland—Liepaja.

blications.

The following papers were published in the *Bulletin la Station Maritime de Hel*, No. 3:—

1. Wołoszyńska, J. Notice sur la microflore du marais "Słona łąka" à Wielka Wieś.
2. Mańkowski, W. Notice on the zooplankton in the Gulf of Danzig.
3. — *Oithona similis*, an element of the West Baltic plankton in the Gulf of Danzig.
4. Bursa, A. Notice on some interesting plankton species till yet unknown from the Gulf of Danzig.

Portugal.

No plankton work was carried out in 1928.

Scotland.

The research vessels "Explorer" and "Kathleen" carried out regular and systematic plankton sampling concurrently with hydrography, trawling and seine-netting, from March to December. The "Explorer" operated largely in the North Sea between latitudes 55° and 61° N. An extensive cruise, chiefly hydrography, however, was made in June into the North-East Atlantic, extending westwards to longitude 18° W. and northwards to 30 miles from the south coast of Iceland. The usual crossing of the Faroe—Shetland Channel and a circuit of the Faroes were effected in July, while in August the vessel worked southwards within the continental plateau along the west coast of Scotland as far as the 56th parallel, in inner and outer Hebridean waters. The "Kathleen" operations were confined to inshore waters, where similar comprehensive surveys were carried out along the east and north Scottish coasts. The Oceanographic Laboratory, Leith, continued the plankton recording lines on selected shipping routes and maintained collaboration with the Laboratory at Aberdeen.

The following nets were utilised:—

1) the Standard Net for phytoplankton.
2) the Hensen quantitative net for zooplankton—including plaice eggs.
3) the 2-metre ring net (vertical) for macroplankton.
4) the 1-metre ring nets, chiefly for fish larvae and to supplement the 2-metre collections.

A few surface samples were collected by the Hentschel method during the Atlantic cruise.

The main results of the year's investigations will be found in the report of the Northern North Sea, pp. 28—29.

Papers on the "Centrifugal Pump" and the "Distribution of Sagittae in Scottish Waters" have appeared in recent issues of the *Journal du Conseil.*

Spain.

No report received.

Sweden.

See Transition Area Report, p. 53.

Note.

The Attention is drawn also to the various Area Reports in which further details are given for some countries.

SALMON AND TROUT COMMITTEE

1938.

M. Siedlecki.

It is stated in all reports which have been received from different countries that the results of the salmon fishery in 1938 were worse than in 1937 and in respect of some countries it is reported that the catches were far lower than the annual average catches. The year 1938 may, therefore, be considered as a very bad salmon year.

With regard to hatcheries, several countries report that during the last spawning season it was difficult to obtain any considerable quantity of salmon eggs. The artificial propagation of salmon was, consequently, nowhere very extensive.

Denmark. (H. Blegvad).

1. Biological Investigations.

Age analyses of salmon by scale readings have been undertaken in the west Jutland rivers; the results of the investigations are published in "125 Salmon from West Jutland" by C. V. Otterstrøm, Medd. fra Komm. for Danmarks Fiskeri og Havundersøgelser, Ser. Fiskeri, Bd. X. The collection of scales of salmon and trout and of statistics relating to the weight and length in Randers Fjord and the River Gudenaa have been continued.

Investigations in water-courses as to the amount of food available and the condition in general for fry have been continued with the object of determining the optimum amount of fry which could be liberated. The following paper has been published in respect of these investigations "On Methodical Liberations of Salmon and Trout Fry in Watercourses with Special Reference to the Gudenaa Area" by C. V. Otterstrøm. Rep. Dan. Biol. Stat., Vol. XLII, 1937.

Marking experiments with **salmon** and **sea trout** have been carried out in the Rivers Kongeaa and Skjernaa which flow into the North Sea.

2. Statistics for the year 1937 (from *Fiskeri-Beretning 1937*, Danish Board of Fishery).

Catches in	Salmon kg.	Trout kg.
North Sea, Skagerak and the Fjords	9,614	3,568
Limfjord	0	21,657
Kattegat and the Sound	11,116	14,071
Belt Sea	4,677	11,272
Baltic	26,990	6,819
Total...	52,397	57,387

The total catch of salmon in all waters (except the Belt Sea) was lower than in 1936. In the Baltic it amounted to only one-half of the catch of the year 1936. The catch of sea trout was also considerably lower in 1937 than it was in 1936; in the Limfjord it was less than one-half of the yield of the year 1936 and less than one-third of the yield in 1935.

Estimates of the Yield of the Salmon Fisheries around Bornholm in 1938.

The yield of the spring fishery was, as in 1937, very poor and the total yield of the year 1938 will, no doubt, be less than that of the year 1937.

3. Artificial Propagation.

Output in 1937 (in thousands) of fry of Sea Trout in watercourses leading

to the:	Fry	Half-yearlings
North Sea	856	40
Skagerak	15	—
Limfjord	724	32
Kattegat	1,066	129
Belt Sea	498	15
Western Baltic	17	—
Baltic proper	213	—
Total...	3,389	216

The output of sea trout fry was about 25 % lower than that of 1936; this was, at any rate, in part due to the difficulties experienced in getting sufficient numbers of female fish for breeding.

In addition 20,000 baby salmon and 6,000 half-yearlings as well as 7 million of *Coregonus lavaretus* were liberated in rivers leading to the North Sea.

Éire. (A. E. J. Went).

1. Biological Investigations.

Further observations were made on the variation of food and growth of brown trout from acid and alkaline waters as typified by two selected portions of the River Liffey. A report embodying the results of this work has been accepted for publication in the *Proceedings of the Royal Irish Academy*. The investigation into the stocks of the salmon from the River Shannon made further progress during the year.

Artificial Propagation of Salmon and Trout.

Hatchery operations were carried out with varying ults at thirty-nine stations, of which twenty were ked entirely with eyed ova obtained from some er hatchery, whilst the remainder were wholly or tially stocked by stripping fish taken locally for purpose. Ova from salmon were collected by pping at twelve stations, from sea trout at three tions, and from brown trout at ten stations.
he total number of fry distributed was

mon fry	5,980,000
trout fry	1,085,000
own trout fry	140,000
Total	7,205,000

he aggregate number of fry distributed from all cheries showed a decrease of 805,000 on the figures the previous year. The development of fry was tened by warm weather towards the end of the son and in the majority of hatcheries the fry were tributed much earlier than usual.

The Catch of Salmon.

he weight of salmon exported from Éire, which ally only differs slightly from the total catch, was ,350 kg. having a value of £ 96,120. The exports 1938 were less than 50 % of the average for the iod 1924 to 1937 inclusive. The quantities exported month, in kg., were: —

January	2,500
February	29,900
March	42,050
April	69,200
May	121,500
June	162,000
July	49,300
August	3,800
September	100

he proportion of grilse in the catches in 1938 was smallest for many years. The drift-net fishing inly for grilse) off the north and north-west sts of Ireland again experienced a very bad season the total yield was slightly smaller than that 1937.
aking the country as a whole the runs of salmon 1938 did not appear to be as large as in 1937. ge spring fish and grilse runs were very poor and small salmon (2 and 2+ years) were not as rous as usual. The condition of salmon from y rivers was not as good as usual.

Marking Experiments.

he marking experiments at Glenties hatchery e continued, 204 salmon being marked and ased after stripping in the River Owenea. Six which had been previously marked were recap- d during the season either in the estuary of the er Owenea or in the river itself.

5. Papers published or in the Press.

1) Went, A. E. J. "Salmon of the River Shannon". Proceedings of the Royal Irish Academy, Vol. XLIV, Section B. No. 11. September, 1938.
2) — "The Salmon Fishery. A statistical survey of the Industry". Irish Trade Journal and Statistical Bulletin, Vol. XIII, Nos. 1 and 2. March and June, 1938.
3) Frost, W. E. "River Liffey Survey — 11. The food consumed by the Brown Trout (*Salmo trutta* Linn.) in acid and alkaline waters". Proceedings of the Royal Irish Academy, Vol. XLV. Section B, 7.

England and Wales. (T. E. Pryce-Tannatt).

Complete returns of the catch of salmon and sea-trout from the various districts are not yet available. It is therefore not possible to furnish more than a very rough indication of the quality of the fishing throughout the country generally.

It can definitely be stated that the quality was poor, even poorer than in 1937, everywhere except in the area drained by the rivers flowing into the Irish Sea between the Island of Anglesea and the Scottish side of the Solway Firth. In the latter area the results were rather better than in the previous season, but the slight improvement was entirely inadequate to counteract the marked decline in the catch of salmon throughout the country as a whole. In the areas which produce them, seatrout were more numerous, but relatively to salmon their contribution to the total weight of the annual catch is not of great significance.

The details required according to the decision of the Committee, similar to those recorded from other countries, have not been compiled. For the year 1938 the details are not yet available; for 1937, however, the reader is referred to *Salmon and Freshwater Fisheries, Report for the year 1937*, issued by the Ministry of Agriculture and Fisheries, 1938.

Finland. (T. H. Järvi).

Material for scale analysis of **salmon** was collected as in previous years in the Tornio, Kemi (estuary) and Oulu, Kokemäki and Kymi Rivers. The yield of salmon in 1938 was very low, even lower than in the previous year.

Salmon fry were liberated as follows: in Paatsjoki (Petsamo) 50,000; in the River Kemi 529,000; in the River Oulu 521,000; in the River Kymi 4,000. The total number of salmon fry distributed was 1,104,000. One-summer-old parr were liberated as follows: in the River Kemi 28,950; in the River Oulu 3,110; making a total of 32,060 individuals.

Eggs of **Chinook salmon** sent from Oregon, U.S.A., were hatched privately. Baby fry were liberated in the River Oulu to the number of 18,200 and one-summer-old parr in the River Karvia to the number of 4,000; in the River Kokemäki 15,000; in the River Kymi 3,500; in the River Oulu 28,500; making a total of 51,000 one-summer-old parr.

Publications.

JÄRVI, T. H. "Fluctuations in the Baltic Stock of Salmon (1921—1935)". Rapp. et Proc.-Verb., Vol. 106, and also, in Finnish, "Vaihtelut Itämeren lohikannassa — Suomen Kalatalous, Finlands Fiskerier", 13.

France. (L. KREITMANN).

Il n'est pas tenu en France de statistique pour la capture du **saumon.** Si les pêcheurs professionnels pouvaient être astreints à déclarer leurs prises, qu'il s'agisse des inscrits maritimes dans les estuaires ou des adjudicataires de pêche dans les cours d'eau du domaine public, il semble difficile par contre d'obtenir des renseignements précis par les sportifs qui peuvent pêcher librement à la ligne dans ces mêmes cours d'eau et à plus forte raison sur ceux pratiquant les cours d'eau non navigables et non flottables où le droit de pêche appartient aux riverains.

Quoiqu'il en soit, on peut estimer très approximativement à un chiffre variant entre 20 et 30,000 le nombre des saumons qui sont capturés chaque année en France.

Les cours d'eau dans lesquels se font principalement ces pêches, sont en premier lieu les affluents de l'Adour connus sous le nom de Gaves, les Gaves de Pau et d'Oloron, le Saison ou Gave de Mauléon, la Nive et la section de l'Adour coulant en aval du confluent des Gaves réunis.

Dans l'Adour, la pêche est exploitée suivant les règles de la pêche maritime, de l'embouchure jusqu'à 21 km. en amont, en un point fixé administrativement là où les eaux cesseraient d'être salées, puis suivant les règles de la pêche fluviale, mais encore par les inscrits maritimes, dans une section longue de 23 km. et dénommée ancienne zone mixte. Bon an, mal an, la pêche rapporterait 9 à 16,000 saumons.

Dans l'ancienne zone mixte, il aurait été capturé en 1937, 1,195 saumons, pesant 12,000 kg. et en 1938, 820 saumons pesant 7,730 kg.; ces chiffres sont certainement faibles, ceux pour 1938 sont obtenus par les ventes à la criée au Halles de Bayonne et peuvent être considérés comme s'approchant le plus de la réalité.

Dans les autres rivières du bassin de l'Adour, seule est exercée la pêche sportive à la ligne. Une disposition figurant à l'article 110 de la loi de finances du 31 Décembre 1936, excepte des cours d'eau où la pêche à la ligne flottante tenue à la main est permise à tout individu, en dehors de la fraye, ceux qui sont soit en entier, soit sur certaines de leurs parties plus spécialement fréquentés par le saumon et réservés à la reproduction du poisson. Les cours d'eau ainsi réservés ont été, en premier lieu, la Nive, le Gave d'Oloron, le Saison et le Gave de Pau, dans toutes leurs parties où le droit de pêche appartient à l'Etat.

L'application de ces dispositions a permis dans une certaine mesure un contrôle de la pêche; le nombre des captures déclarées est indiqué ci-dessous; il donne un ordre de grandeur plutôt que des valeurs absolues; car, basé sur des déclarations qui donnent lieu à la perception d'une taxe par poisson, il est certainement inférieur à la réalité, surtout en 1938.

Dans la Nive, 162 saumons ont été capturés en 1937, et 12 en 1938;

dans le Gave de Pau, 3 en 1938;

dans le Gave d'Oloron, 609 en 1937 et 276 en 1938.

La Garonne a été très fréquentée par le saumon autant dans son propre cours, que dans celui de ses affluents, le Lot et surtout la Dordogne et la Vézère. Actuellement le saumon est arrêté sur la Garonne par le barrage du Bazacle et il ne dispose plus que de frayères très réduites en aval. Sur la Dordogne, le barrage de Tuillière à la hauteur de Bergerac lui est devenu en 1914 un obstacle infranchissable, qui, depuis lors a été aggravé par l'ouvrage de Lalinde situé immédiatement en amont. La statistique marque la conséquence de ces travaux pour la pêche du saumon: les captures se sont maintenues à la pêcherie de Bergerac jusqu'en 1918 à un chiffre moyen de 560 et il est tombé à 57 en 1919 et à quelques unités à partir de 1924.

Dans le bassin de la Loire, autrefois très riche, la seule ligne d'eau dans laquelle la pêche du Saumon reste encore active est celle figurée par la Loire jusqu'à son confluent avec l'Allier et prolongée par ce dernier cours d'eau; elle y est pratiquée jusqu'au barrage de Jonchères, à 800 km. de la mer; les affluents de l'Allier, la Dore, la Sioule, l'Allagnon, sont également fréquentés par le saumon. Les captures annuelles peuvent être évaluées à environ 5 ou 6,000 pièces.

Il est une section de la Loire où une disposition spéciale a permis de 1936 à 1938 d'établir une statistique exacte pendant une partie de l'année. Les inscrits maritimes ont eu en effet l'autorisation de pêcher sous réserve d'un contrôle rigoureux du 15 Novembre au 10 Janvier, c'est-à-dire pendant la période générale de fermeture, dans la section comprise entre Cordemais et Thouaré sur une longueur de 41 km., juste en amont du point où les eaux cessent d'être salées. Les statistiques ont donné pour la période correspondante de 1936—1937, 296 saumons capturés et pour celle de 1937—1938, 28.

En amont de Thouaré et jusqu'à Gien, la pêche est principalement exercée par des professionnels à l'aide de filets-barrages: ce sont des filets fixes, tendus sur des piquets, perpendiculairement à la rive; au cours de la remontée, le poisson vient buter contre le filet, il se déplace le long de l'obstacle et il vient à passer au-dessus d'un carrelet qui est remonté brusquement à ce moment; ces filets ne peuvent pas barrer plus des deux tiers de la largeur du fleuve; de plus, ils doivent être relevés trente-six heures par semaine du samedi à 18 heures au lundi à 6 heures. Il existe 65 filets de ce genre sur 700 km. de la Loire. Les captures déclarées se sont élevées à 2,714 en 1936, à 2,759 en 1937 et à 1,718 en 1938, avec un poids moyen de 8,500 kg. par poisson.

En Bretagne, on trouve encore quelques bonnes rivières à saumons. Certes, leur rendement n'est plus comparable à ce qu'il était, quand il n'y avait encore ni barrages pour arrêter la remontée, ni industrie

pur polluer les eaux, ni enfin moyens de transport pur faciliter les expéditions au loin; la Laïta et ses fluents longs de 35 km. produisaient alors chaque nnée une dizaine de milliers de saumons; aujourd'hui s captures que l'on y fait se réduisent à 6 ou 800; pur l'ensemble de la Bretagne, elles ne dépassent s sans doute 5 à 6,000 pièces; les meilleures rivières nt encore l'Aulne, l'Odet et son affluent le Jet, le rieux, le Scorff, le Guer et la Penzé.

Les cours d'eau tributaires de la Manche ne sont us fréquentés par le saumon ni avec régularité, ni abondance. Font cependant exception à cette gle trois cours d'eau du Cotentin, la Sienne, la Sée la Sélune, cette dernière avec une certaine réserve, r un barrage élevé depuis peu interdit l'accès de majorité des frayères.

Le saumon n'est plus capturé dans la partie fran- ise du bassin de la Meuse; il l'est encore dans le hin français de Lautenbourg à Huningue; le grand rrage de Kembs a été muni d'une échelle et d'un enseur; le contrôle des passages a donné les sultats suivants en 1935:

267 journées de contrôle, 47 saumons par l'échelle
227 journées de contrôle, 33 saumons par l'ascenseur[1]).

De cet aperçu général, on peut déduire qu'avec ne capture annuelle de 20 à 30,000 individus, la che du saumon est en régression marquée depuis elques décades; elle est maintenue dans quelques urs d'eau; elle pourrait retrouver son activité; et s conditions susceptibles de ce retour à l'ancienne ondance sont que les abus de la pêche dans les tuaires par les inscrits maritimes soient réprimés r une réglementation sage et prévoyante, que la nstruction d'échelles à poisson, déjà réussie sur s barrages des Gaves, soit continuée en premier u sur la Dordogne et sur la ligne d'eau Loire— enne—Creuse—Gartempe et enfin que la répression braconnage soit efficacement assurée.

D'autre part, les captures varient énormément une année à l'autre; faible en 1938, la remontée vère bonne en 1939; il serait intéressant à cet ard de reprendre les années de fraye et de descente tacons et de chercher une concordance entre les nditions du repeuplement naturel et celles de la montée: de telles recherches rentrent dans le cadre celles que peut entreprendre le nouveau labora- ire du saumon créé par la Direction Générale des ux et Forêts au Musée de la Mer de Biarritz, avec s concours éclairés de la Municipalité de Biarritz de la direction du Musée.

Germany.

eport by Dr. Lehmann).

Auf dem Gebiet der Lachsuntersuchungen ist ährend der Fangperiode 1937/38 Untersuchungs-

[1]) En 1936, les chiffres ont été de 97 saumons par chelle en 5083 heures de contrôle et de 38 saumons par scenseur en 3393 heures.

Material entnommen worden. Die Lachsangelfischerei vor der ostpreussischen Küste hat keine guten Ergebnisse geliefert; es sind hauptsächlich grössere Lachse gefangen worden.

Das bisher gesammelte Schuppenmaterial von Lachsen bis einschliesslich Fangperiode 1935/36 ist aufgearbeitet; das Material 1936/37 ist in Bearbeitung. Eine Veröffentlichung über das frühere Material steht bevor.

Im Jahre 1937 sind durch die Seefischereistation Neukuhren über 700 Salmonidensetzlinge, davon über 200 Lachssetzlinge, markiert und bei Neukuhren in die Ostsee ausgesetzt worden.

Die Forschungsstelle an der ostpreussischen Küste hat die ganzen Fänge an Salmoniden, die sich im Oktober und November zwecks Aufsteigens in den Lachsbach bei Neukuhren vor demselben eingefunden hatten, zur Untersuchung erhalten. Im November und Dezember wurden über 1000 Stück markierte Setzlinge von Salmoniden an verschiedenen Stellen ausgesetzt um festzustellen, ob der Aussetzungsort bei Meerforellen von einer gewissen Bedeutung für den Wiederfang ist.

Salmonids (E. Fischer).

Last year, as in preceding years, brown trout and rainbow trout were liberated in Wismar Bay; brown trout: 30 kg. two-summer ones and about 2000 fry, rainbow trout: some 6000 one-year parrs and about 10,000 fry were so dealt with. Further liberations of white fish (Maränen) were made; these experiments, carried out continuously since 1935, seem to have had practical results. Large numbers of both marked and unmarked brown trout were recaptured last year; and many marked and unmarked rainbow trout were caught in Wismar Bay and adjacent areas especially. A preliminary note entitled "Aussetzungen von Regenbogenforellen in die Ostsee" was published by Dr. Meyer in the *Berichten der Deutschen Wissenschaftlichen Kommission für Meeresforschung*, Vol. 9, No. 2. Last year a total of 144 brown and rainbow trout, marked or unmarked, were received from the Wismar Bay and carefully examined; to these, however, must be added the fish marketed directly at the coast. Considering the high rate of growth of salmonid fishes liberated in the Baltic, there can be no doubt that with the high prices which these valuable species command the cost of the liberations will be more than met. This indicates a new way of increasing the fish stocks of the Baltic. A detailed account of the experiments and their results is in preparation.

(Report for 1937 and 1938 by A. Willer).

1) Age Determinations. (Large-scale work was carried out for salmon only.) The investigations concerning the stock of East Prussian rod- and net-caught salmon started in 1928 were finished. In continuation of the publications by Willer and Quednau (1), based on the analysis of the material

collected during 1928 to 1931, Dr. Brandtner dealt with the material from 1931 to 1936. His results were published in 1938 in the *Zeitschrift für Fischerei* (2).

The material used by Dr. Brandtner was taken from a total of 2,790 salmon. In salmon investigations, this may be called a very extensive material. The results under the several headings were as follows:

Length and Weight. As previous investigations have shown, the salmon caught in winter off the East Prussian coast have no length values that can be arranged regularly in relation to a median. Neither could any deviation be calculated for all years in the length of salmon at the beginning and end of the fishing season. On the other hand, a constant relation could be found between the total yield of the catch in individual years and the frequency of the individual length-groups. During the period under review, for instance, the greater length-groups were predominant in poor years, and the smaller length-groups in good years.

Age. While the composition of the East Prussian catches according to parr period shows very great similarity to the composition of the stocks from the north Swedish rivers as far as the seasons 1928/9 to 1930/1 are concerned, the seasons 1931/2 to 1934/5 give another picture. Even if salmon of 5-year parr life do occur, the high percentage of salmon of 2-year parr life indicates that these fish have not originated only from the northernmost rivers of the Baltic. It must be assumed that some of the salmon come from more southerly rivers. The three seasons 1931/2 to 1933/4 were specially good salmon years. It is possible that the better yields were due to the presence of relatively many salmon from southern rivers. This assumption is confirmed by the declining returns since 1934/5 and by the rising percentage in the catches of salmon of more than 2-year parr life.

The age determinations also showed among other things that the percentage of 2-year parrs declines towards the end of the fishing season. This observation agrees with the results obtained by Dixon in his investigations of rod- and net-caught salmon in Danzig bay. The conclusion thus seems justified that salmon from southern rivers arrive somewhat earlier on the east German coast than do the salmon from northern rivers.

Inspection for spawning marks showed that the percentages of salmon with spawning marks differ very much in the catches of individual years. After spawning the greater number of the salmon examined have lived one year in the sea before being caught. Investigations were made as to whether and to what degree good or bad salmon years can be predicted from the occurrence of salmon with spawning marks. Up to the present the results of the investigations point to the existence of relationship between the number of salmon with spawning marks on their scales and the yields of the fisheries in later years. Nevertheless further investigations only can show how much dependence can be placed upon forecasts, from the number of kelts, of spawning and the resulting catches.

2) Sexual Maturity and 3) Food and Feeding Habits.

The work on maturity and food, which Dr. Bahr(3) carried out during 1933/6 on salmon off the East Prussian coast, could not be continued in the two years under review, nor were similar investigations undertaken from other quarters.

4) Marking Experiments and 7) Correlations between Migrations and Rate of Growth in the Sea.

The marking experiments on salmon and sea trout carried out for some time past off the East Prussian coast have been continued. The work received important assistance through the liberations of marked and unmarked rainbow trout made by Dr. P. F. Meyer in the western Baltic. These investigations, on which a preliminary paper has been published (4), show that 2-year-old European rainbow trout are able to live for some time in Baltic water of a salinity of about 15 ‰. Both the rainbow trout concerned in the investigations and the brown trout grow much more strongly in tidal than in non-tidal waters. After several summer months spent in the sea length increments of almost twice the length on liberation were observed in a number of instances. The incentive to migration did not seem to be strong in the rainbow trout; all recaptures were made in the immediate vicinity of the place of liberation.

5) Efficacy of Hatcheries.

Following are the quantities of salmon and sea trout larvae hatched during 1937 at German hatcheries in the Baltic area: —

	Sea Trout	Salmon
Hatcheries in East Prussia.....	14,000	3,000
— - Pomerania	500,000	
— - Schleswig Holstein	528,000	—

No details can be given regarding the results of the last season beyond the general fact that 1938 was a bad salmon year.

The figures for the landings of salmon as part of the German Baltic fisheries during the years 1934 to 1937 are given below: —

Total Catch of Salmon and Sea Trout (in millions of kg.)

1934	1935	1936	1937
2·0	1·2	1·0	0·6

The figures cannot be given separately for the two species, which are not distinguished in the German fisheries statistics.

6) Stock of Sturgeon.

No data are available for the two years under review.

ublications.

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— Untersuchungen über den Lachs (*Salmo salar* L.), III. Zeitschr. f. Fischerei, Bd. XXXII, 1934.

UEDNAU, W. Untersuchungen über den Lachs (*Salmo salar* L.), II. Die Angelhakenmethode bei der Erforschung der Lachswanderungen und ihre bisherigen Ergebnisse. Zeitschr. f. Fischerei, Bd. XXX, 1932.

BRANDTNER, PAUL. Untersuchungen über den Lachs (*Salmo salar* L.), V. Zeitschr. f. Fischerei, Bd. XXXVI, 1938.

BAHR, K. Untersuchungen über den Lachs (*Salmo salar* L). IV. Nahrungs- und Gonadenuntersuchungen bei ostpreussischen Treibnetzlachsen. Zeitschr. f. Fischerei, Bd. XXXIV, 1936.

MEYER, P. F. Aussetzungen von Regenbogenforellen (*Salmo irideus* Gibb.) in die Ostsee. Ber. d. Deutsch. Wiss. Komm. Meeresforsch., N. F. IX, 2, 1939.

Holland.

No report available.

Latvia (V. MIEZIES).

The total catch of salmon and sea trout in the sea ong the Latvian coasts of the Baltic and the Gulf Riga amounts in 1938 to 71,470 kg., a decrease om the previous year of about 13,500 kg., and about ,000 kg. less than the 14 years average: 1924—1937. he decrease was due to the lower catches in the ner part of the Gulf of Riga, e.g., near the mouth the rivers Daugava and Gauja.

In accordance herewith the run of salmon and sea out in the Latvian rivers was inferior to those of evious years, and also lower quantities of fertilized lmonid eggs were collectable for hatching purposes.

tatistics of Salmon and Sea Trout Fisheries.

Statistical data are available only for fisheries in e sea, the corresponding material for the fisheries rivers will not be published.

The following table shows the comparison of salmon fisheries in the sea for the years 1938, 1937 and 1936.

Table 2.

	1938 kg.	1937 kg.	1936 kg.
Region 1. Gulf of Riga:			
a) Coast of Vidzeme ...	11,990	12,067	5,148
b) Riga coast	50,790	62,349	37,661
c) Coast of Kurzeme...	1,807	1,027	1,659
1. a-c Total in the Gulf of Riga.....	64,587	75,443	44,468
Region 2. Kolkasrags	1,595	2,429	1,872
Region 3. Ventspils.....	3,925	4,257	1,996
Region 4. Liepāja	1,363	1,879	2,285
Total catch of Salmonidae in Latvian waters..	71,470	84,008	50,621

Artificial Propagation.

In the spring of 1938 the following quantities of salmonid and coregonid fry hatched in the Government's hatcheries of Tome, Kārli and Pelči were released in Latvian inner waters:

Salmon:	
Daugava.....	1,370,000
Gauja	435,000
Total...	1,805,000
Sea Trout:	
Daugava.....	1,300,000
Gauja	1,685,000
Total...	2,985,000
Brook Trout:	
in various rivers.....	25,000
Lavaret (*C. lavaretus*):	
in various rivers.....	2,480,000
Peipus-lake Whitefish (*C. generosus*):	
in various lakes	5,750,000

The number of salmonid and coregonid eggs, collected for cultivation at the Government's hatcheries of Tome, Kārļi and Pelči in the autumn of 1938 was:

Table 1.

Catch of Salmon and Sea Trout in Latvian Coastal Waters 1938.
(in kg.)

Regions	Jan.	Febr.	March	April	May	June	July	Aug.	Sept.	Okt.	Nov.	Dec.	Total
a. Coast of Vidzeme..	71	489	358	252	320	852	320	535	4,960	2,713	1,120	—	11,990
b. Riga coast	339	284	501	1,684	2,510	7,942	6,880	6,807	18,720	5,123	—	—	50,790
c. Coast of Kurzeme.	—	35	60	555	749	285	—	8	65	50	—	—	1,807
a-c. Total in the Gulf of Riga	410	808	919	2,491	3,579	9,079	7,200	7,350	23,745	7,886	1,120	—	64,587
Kolkasrags coasts...	6	82	275	220	119	—	—	130	267	496	—	—	1,595
Ventspils coasts	107	64	116	363	251	67	57	726	1,684	484	—	6	3,925
Liepāja coasts.....	55	149	163	383	187	110	—	—	43	8	—	265	1,363
4. Total on the Latvian coast	578	1,103	1,473	3,457	4,136	9,256	7,257	8,206	25,739	8,874	1,120	271	71,470

salmon	2,170,000	
sea trout	2,664,000	
lavaret	850,000	(collected in Latvia)
—	222,000	(— - Estonia)
whitefish	4,175,000	(— - —)

Biological Investigations.

The collecting and study of material relating to age-distribution and growth-rate of salmonid fishes from the rivers Daugava and Gauja was continued by the Fishery Laboratory (Ministry of Agriculture). Also successful marking experiments were carried out, a number of marked specimens being recaptured in the Gulf of Riga.

Norway.

(From the N-E-Area Report).

Salmon marking experiments at sea were commenced in 1935, and have been continued during 1938, by marking 562 fish: 230 near Sørøy (Finmark), 200 at Trøndelag and 132 at the west coast. Until August 15th, 211 recaptures are recorded, but further reports may be expected. The marking of young salmon — parrs — was hampered by the exceptional high tide in the rivers. Extensive collections of scales were made.

Sea trout markings were made at Trøndelag and at the west coast, 486 fish being marked. Several interesting recaptures have been made already. A number of **lake trout** — in a lake unapproachable from the sea — were marked; more than 10 % of these were recaptured at sea, partly among sea trout marked in the neighbourhood.

Poland. (M. Siedlecki).

Biological Investigations.

The composition was studied of the food of the **brown trout** transferred artificially from the rivers into the Baltic Sea. It was reported that, in the sea, trout take their food chiefly from the bottom, the main food being Crustaceans (*Gammarus* and *Crangon*) and some fishes (Goby and Herring). The results of these investigations are in accord with previous studies made by Altnöder. — Materials for the study of the **salmon** stock near the Polish coast were collected. — Parasites of young salmonoid fishes were studied.

Statistics for 1938.

Small salmon (Mielnica) 1,100 kg.; large salmon 25,760 kg. The run of salmon and of sea trout in the Vistula and its tributaries was good.

Marking Experiments.

The following numbers were liberated of marked one- or two-year-old smolts: Salmon — 950 smolts liberated in the Upper Vistula and the River Brda; Sea Trout — 370 smolts liberated in the Upper Vistula; Brown Trout and Rainbow Trout 3,000 liberated in the Upper Vistula and 1,324 directly in the Baltic Sea.

Artificial Propagation.

The following quantities of baby fry and of smolts were liberated:

Salmon and sea trout:
Baby fry — 260,000 (of which 10,000 were liberated in the River Wilija and the rest in the Vistula and its tributaries).
Smolts — 13,300 (of which 3,250 were liberated in the River Wilija and the rest in the Vistula).
Brown trout:
Baby fry — 1,600,000 (liberated in various rivers).
Smolts — 43,000 (liberated in various rivers).

In the autumn of 1938 artificial spawning gave the following results: 150,000 eggs of salmon, 430,000 eggs of sea trout and about 800,000 eggs of brown trout, all of which were placed in hatcheries.

Protection of Salmonoid Fishes.

In the upper part of the River Dunajec, near the spawning grounds of the sea trout, there is now a great barrage under construction 27 metres in height. A large fish-pass will be constructed in order to allow the fishes to pass from one level to another.

Portugal. (A. Ramalho).

In the present conditions prevailing no report can be prepared in respect of salmon investigations or salmon fisheries.

Scotland. (W. J. M. Menzies).

1. Catch.

The run of **salmon** in Scotland in 1938 was somewhat varied. Grilse (1+ winters in sea) were poor on all sections of the coast, and represented less than a third of the average crop. On the west coast, the numbers were the same or a little worse than in 1937, but, on the east coast, the run of grilse in 1937 was good, and the 1938 catch was only about a third of that of the previous year. Older salmon (2 and 2+ winters in the sea) were also poor as in 1937 on most parts of the west coast, but the run of spring fish (mostly two winters with some three winters in sea) on the east coast was up to the average. The run of summer salmon (mostly 2+ winters in sea) was, on the other hand, poor, and the late (August—September) run was particularly bad.

Sea trout were distinctly above the average on all coasts, and the average size was also rather better than usual. The majority of the fish are of the 1+ winters group, but there may be from 10 to 30 per cent. of previously spawned trout in addition. There was also an exceptionally good crop of young trout in their first summer after migration as smolts (usually called whitling or finnock). Statistics of the number

fish caught cannot be obtained, but the nett ght of salmon carried by railway and steamer on east and north, and on the west coast respectively ing the last three years are as follows:—

Year	1936 kg.	1937 kg.	1938 kg.
t and north coasts	2,909,000	2,681,000	2,076,000
st coast.....	397,000	248,000	239,000
Total...	3,306,000	2,929,000	2,315,000

Investigation of Age-Classes.

paper by Mr. P. R. C. MACFARLANE based on es from 1890 **salmon** taken in the upper Solway was published during the year. The chief features wn in the report are that the fishery is chiefly endent on grilse (1+ winters) and that the portion of previously spawned fish (1·1 %) is the est yet recorded in any of the Scottish investi- ons. Spring fish (2 winters and 3 winters in rly equal proportions) form only a fifth of the l catch; 90 per cent. of the smolts are two rs of age, and the balance are chiefly three years but the average calculated length is the highest encountered. The calculated lengths at the end he first and second winters in the sea are higher n those found on the east coast, and are, con- ently, in consonance with other west coast stigations. The Solway collection was of fish nging to rivers tributary to the upper part of Solway Firth.

further paper on scale examination by Mr. G. W. RTLEY was also published on a sample of fish specimens) taken towards the north end of the t coast. From results obtained from marked fish, known that the fish in this sample originated in a e number of rivers on both the east and the west sts. The calculated lengths of parr and smolts firm this mixed origin, and show that the sample s a non-homogeneous group. The majority of the were grilse, and only 1·5 per cent. were on their nd return to fresh water.

further paper by Mr. G. H. NALL on the sea trout he Carron (west coast of Scotland) was also pub- d, and was based on 1811 sets of scales and mea- ments obtained from the fish in fresh water. Here average age of the smolts was high, 60 per cent. g three years old, and 10 per cent. 4 years old, only 25 per cent. 2 years of age. The smolts , however, well grown, the average lengths of the , three-, and four-year-old fish being respectively , 18·7, and 21·3 cm. Sea growth was of the erately slow-growing type, and accorded with ctations for sea trout of the west coast. Of the l, 40 per cent. were on their second or subsequent rn to fresh water.

f a small collection of salmon (123 fish) from the e Carron district, Mr. MACFARLANE, in the same r, shows that small spring fish (2 winters) pre- inated, and that the summer fish were divided between 1+ and 2+ winters groups. The very remarkable proportion of 18 per cent. were on their second return to fresh water, and, of these, eight had spawned on two and one on three previous occasions. The smolt ages were the reverse of those shown by the sea trout: 60 per cent. being two years old, and 40 per cent. three years old.

3. Fish Diseases.

Investigations were conducted by Professor MACKIE and Drs. CHRISTISON and MACKENZIE on the existence of a bacteriophage for *Bacillus salmonicida*. As a result, it has been shown that while a bacteriophage which affects *B. salmonicida* may be found in rivers where furunculosis is known to exist, and in others where it is not known to exist, yet the effect on the bacteria is variable, and is not sufficient to justify any hope of its useful employment. Were a specific bacteriophage, which exercised complete control of the organism, to exist, then it obviously would be of the greatest use in helping to control and exterminate outbreaks of furunculosis, at least in fish farms, but this work has not yielded any indications that the bacteriophage found might usefully be used for this purpose.

A short paper has also been issued by Dr. V. TCHERNAVIN showing that, in addition to the scales, certain bones of the head of the salmon suffer absorption during the change to the breeding dress, and the development of the gonads in fresh water.

4. Marking Experiments.

Salmon were again marked in the sea on the west coast of Scotland during 1938. Of the two marking stations used, one was at the Island of Soay immediately to the south of Skye, and the other at Ardnamurchan, about thirty miles down the coast. From Soay it was found that the recaptures of fish marked during the month of April were made, with four exceptions, on the north and east coasts of Scotland, and that there were relatively important concentrations of these marked fish in Thurso Bay and at the head of the Moray Firth. The furthest travelled fish went as far as the Tay. The distribution of the grilse marked at Ardnamurchan was of quite a different character. None went to the north coast, and only four to the east coast, all the rest were recaptured on the west coast, mostly within 50 miles of the place of marking, but three travelled to rivers in Ireland, and one to a river in Wales. It would appear that the Soay station was on a line of migration of spring fish from the Atlantic round to the rivers of the north and east coasts, while the grilse which reached Ardnamurchan belonged to rivers almost exclusively on the west coast, and that this, furthermore, provided probably the most northerly point on the coast reached by grilse derived from the Irish rivers.

The results of sea trout marked in the Tweed have not yet been published, but a large number of recaptures have shown some interesting movements in

both directions made by kelts and immature sea trout while still in the Tweed during the winter and early spring months.

5. Hatcheries.

The existing hatcheries were used on a small scale, but, owing to the height of water during the spawning season, great difficulty was experienced in obtaining ova. In all, probably not more than two million ova were handled. Detailed plans have been developed for the inauguration of a full scale experiment to test the value of artificial hatching, and it is hoped that funds will be provided in order that this experiment may be commenced in the spring of 1939.

6. Relation between Migration and Rate of Growth in the Sea.

No specific experiments were carried out on this point, but the marking experiments conducted on the west coast show that the fish which were recaptured on the east coast had a shorter average calculated first-year-in-sea length than the marked fish which were recaptured on the west coast. This confirms previous scale experience that the east coast fish have a shorter first-year sea growth than the west coast fish. The difference in average may be from 4 to 5 cm., and is not dependent on average length of the smolts when they descend to the sea.

Publications.

MACFARLANE, P. R. C., B. Sc. Salmon of the Upper Solway District, 1934.

HARTLEY, G. W., B. Sc., Salmon Caught in the Sea — West Sutherland, 1937.

NALL, HERBERT G., M. A., F. R. M. S. Sea Trout of the River Carron and Loch Doule (Dhughaill), Western Ross-shire.

TCHERNAVIN, Dr. V. The Absorption of Bones in the Skull of Salmon during their Migration to Rivers.

Sweden. (N. ROSÉN).

1. Samples of **salmon** scales collected during previous years from the west coast (Skagerak and Kattegat) have been examined, but the examination is not yet completed. Material for scale analysis of salmon has been collected from some rivers in Norrland as well as from Gothland and Blekinge (Baltic).

2. Experiments have been carried out on the effect of impregnating eggs with the sperm of mature smolts.

3. Some marking experiments have been undertaken with young salmon from the coast of Norrland and with spent salmon from two rivers in Norrland.

4. The output of fry in the spring of 1937 amounted to 6,692,520 individuals of salmon fry.

5. No **sturgeon** investigations were carried out.

Sturgeon sold at Gothenburg:

1938 January	26 kg.	=	3	individuals
— February	30 -	=	1	—
— March	65 -	=	3	—
— April	158 -	=	1	—

6. Catch of salmon in 1938: medium; on the west coast below medium.